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The

Chemical Age

VOL LXI

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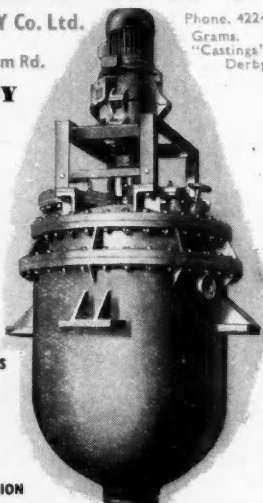
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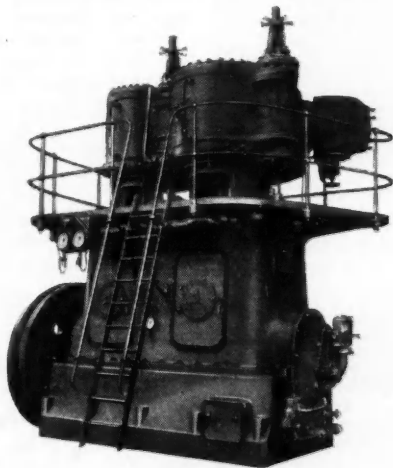
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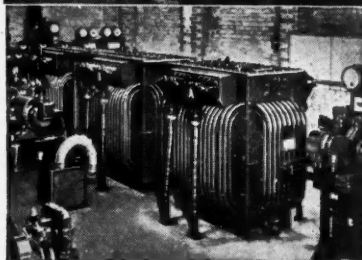
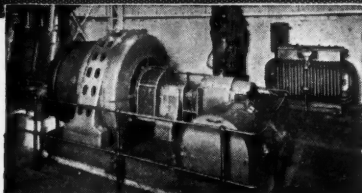
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(Below) Hackbridge transformers installed in a works substation.

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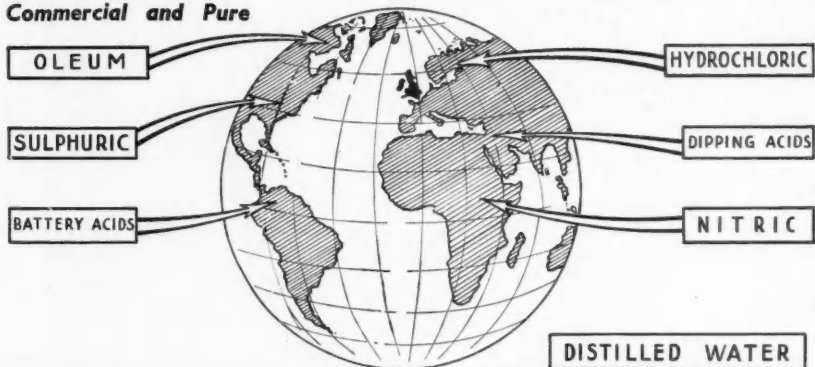
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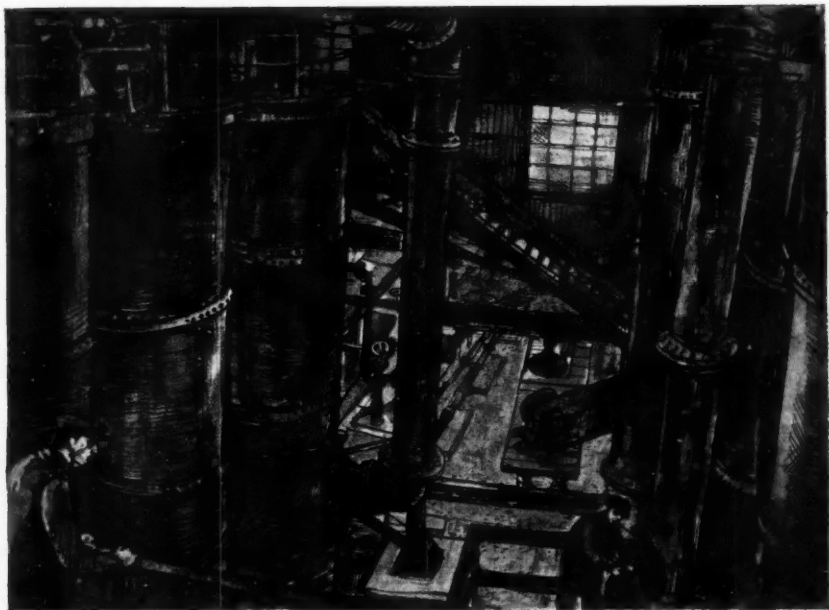
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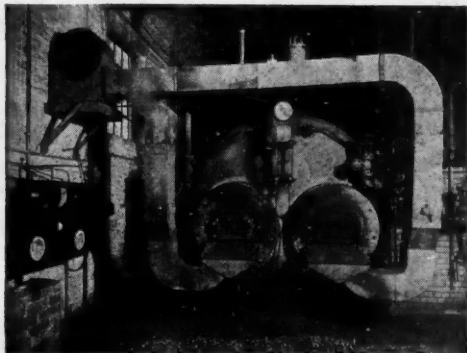
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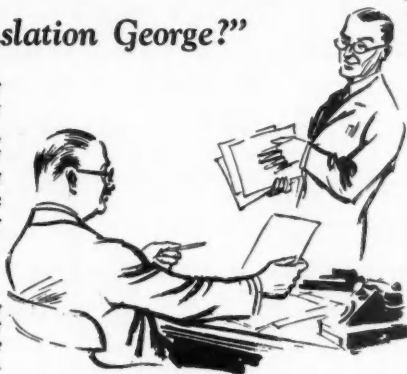
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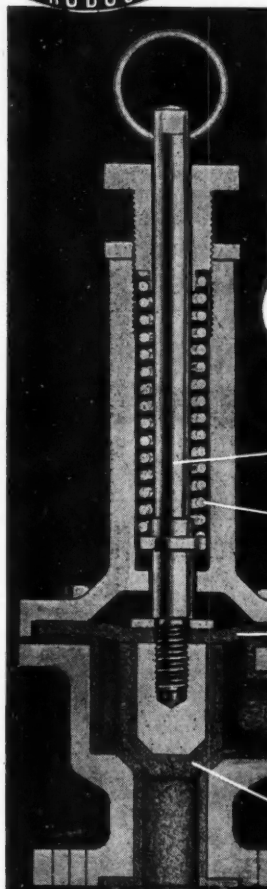
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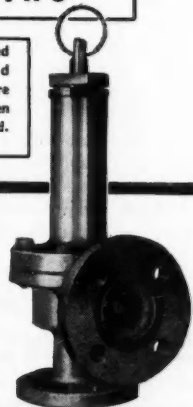
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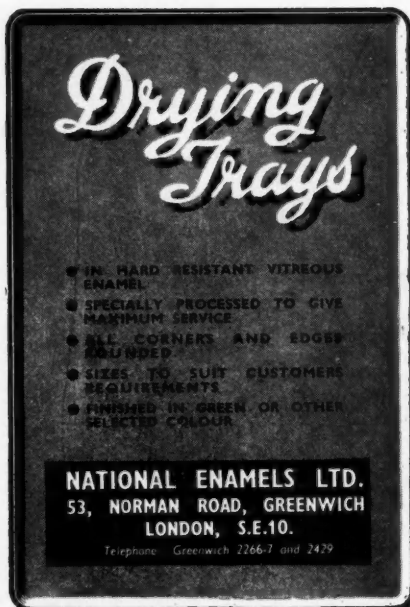
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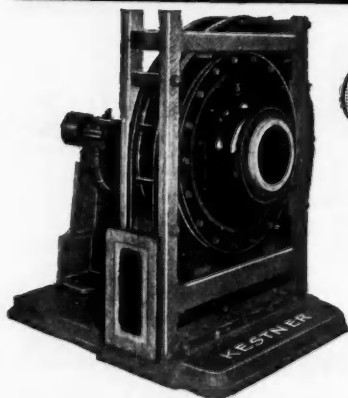
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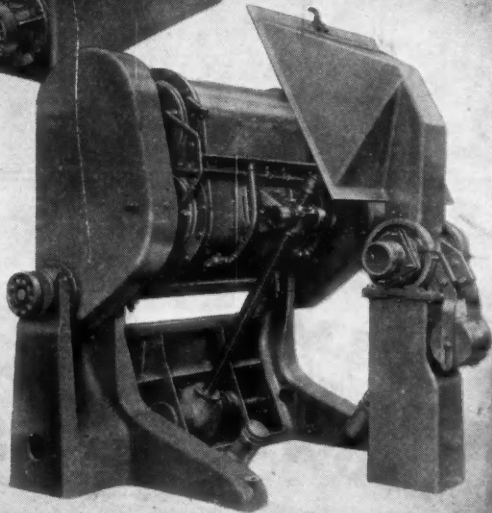
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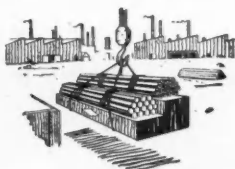
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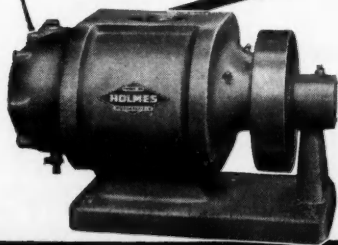
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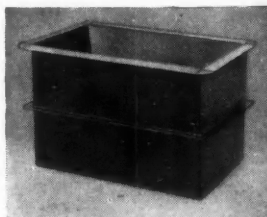
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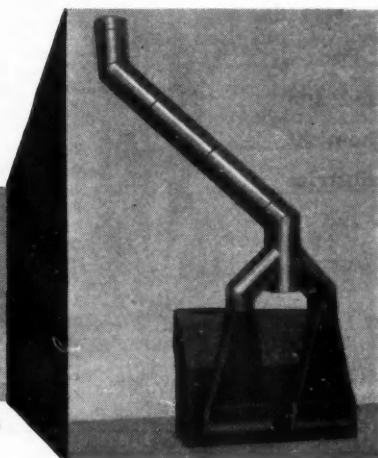


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Volume LXI

3 September 1949

Number 1573

Standardising Scientific Terms

WHILE many of the proposals recently adopted for the standardisation of symbols, units and nomenclature merely codify existing procedure, some important changes are also gaining acceptance and it will be incumbent on industrial chemists and chemical engineers to become familiar with them.

In a recent review of the position in *Nature* 164, No. 4163, p. 263) Sir Charles Darwin, F.R.S., draws attention to the more important results of the post-war discussions of the International Unions of Chemistry and of Physics. The joule has been adopted as the unit of heat in place of the calorie. In the measurement of heat, says Sir Charles, water is now unimportant and unsatisfactory as a basis and the measurement of heat is now usually done electrically. This is by no means an academic matter, as researchers will be required to give results in joules; gradually all the reference books on which the industrial worker relies will give their thermal data in these units. Meanwhile, an essential part of the transformation must be the preparation of conversion tables "together with a critical review of the matter, since many workers are quite unaware what a vague expression the calorie really is."

Just how far-reaching this matter is, is evidenced by the fact that in an average selection of reference books examined from this point of view it was found that the calorie is used almost exclusively for thermal data. Thus Perry,¹ Bayley,² Handbook of Chemistry,³ Landolt-Börnstein,⁴ Kaye & Laby,⁵ in their latest editions, and even the very recent edition of Lowry & Sugden⁶ all employ calorie as the unit. Furthermore, the Handbook of Chemistry³ gives conversion factors for joule to calorie to five figures—extraordinary precision for a "vague expression." Even current issues of J.C.S. and Proceedings of the Royal Society continue to use the "outmoded unit," the calorie. Only International Critical Tables⁷ give most of their thermal data in joules and kilojoules. Chemists and chemical engineers use thermal data—heats of formation, combustion, latent heats and specific heats, etc.—so extensively that publishers and authors alike will have to take careful note of these new decisions. Other decisions, although important in themselves, will not have such widespread effects.

Increasing work in radioactivity has accentuated the confusion in units and the dissatisfaction to which the lack of uniformity gives rise. The curie was

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originally the quantity of radon in equilibrium with a gram of radium. Its meaning has gradually been transformed, so that it has come to be used as a measure of the number of disintegrations per second. As a temporary measure the "international curie" is to signify 3.6×10^{10} disintegrations a second, but there are proposals afoot for the use of the rutherford. The diminished importance of radium, which is suggested by this decision, is confirmed by the news that a joint committee of the two International Unions will supersede the International Commission on Radium Standards.

One of the differences in nomenclature will bring the United Kingdom into line with Continental practice. This is the use of the name Celsius for the temperature scale which we now call Centigrade, and is intended to avoid confusion with the French and German meanings of this word. The International Union of Physics recommended that there should be only one fixed point on the absolute scale instead of the present two, and that this point should be the triple point of water, suitably chosen so as not to alter the existing scale. The Symbols

Committee of the Royal Society, furthermore, has recommended that there should be confirmation of British practice in the definition of the "atmosphere" for those engaged on vacuum or pressure work. They urge that it should remain 76 cms. of mercury at 0° C. and with $g = 980.665$ cm./sec.², despite the challenge of the use of 1000 millibars (the "bar") and the Continental "technical atmosphere" of 1 kgm./cm.² These and some other changes and moves to international standardisation should be seen as part of a great pattern of advance—aiding the development of science, technology, and ultimately of trade.

In the purely mechanical field, similar advances have recently been reported by the International Organisation for Standardisation. Far from leading to a levelling down and a drab monotony, they make possible a far richer equipment by eliminating variety where this is not necessary. It may add to the complexities, but it certainly does not add to the richness of life when British and Continental chemists have to study to discover what is meant when they collectively discuss measurements—and then have to

(continued on page 303)

Notes and Comments

Dollar Chemicals

THE small reduction in July in the value of United Kingdom chemical trading with other countries reflected a trend not peculiar to this country. The U.S.A., largest of the world's suppliers of chemicals, shared almost proportionately the results of the contraction of buying in some of the principal markets. That is one of the salient facts of the half-yearly statement just issued by the U.S. Department of Commerce, which also discloses that chemical export sales of America in six months this year represented the vast turnover of \$450,432,000. This record figure comprised sales to the value of \$226,432,000 in the first quarter and the diminished total of \$224 million in April-June. It is being recognised in the U.S.A. that slackening in trade in the second three months suggested by the dollar totals is not necessarily a complete explanation, since in that period there has been a fairly widespread reduction in individual chemical values. The same argument is, of course, equally applicable to the recent fall in United Kingdom chemical export values. The aspect of the American result, less easy to explain except partially as an effect of Marshall Aid, is how such active trading has been maintained at a time when nearly all the world is short of dollars.

Sir John Simonsen

THE growing readiness to recognise some of the debt owing to chemists who have rendered much of their service outside the orbit of metropolitan affairs is one of the incidental effects of the new awareness of the importance of Colonial economics. The American Chemical Society has furthered that general principle in deciding that Sir John L. Simonsen, F.R.S., should be the first recipient of the American Fritzsche award (with £1000), instituted to "recognise and

encourage outstanding achievement in analysis, research, and new applications of essential oils, essential oil isolates and related chemicals." Sir John, director of the Colonial Products Research Council of the Colonial Office for the past six years, made the first isolation of carvene hydrocarbons from Indian oils, and of the sesquiterpene ketones from Australian oils. He also discovered a number of new essential oil constituents (including thujene and di-piperitone). The second edition of his treatise "The Terpenes" is appearing in three volumes; the first was published in 1947, the second has been delivered to the printers, and the third is due next year. Sir John is deeply concerned with the application of existing knowledge and maintains that the Colonies offer great opportunities for this. He does not disguise, however, that such application will depend to a large extent on the widening of the education of the Colonial peoples, at present hampered by the shortage of foremen, trade schools and technical schools. Sugar, starch and the vegetable oils are among the potent raw materials of the Colonies, regarded by Sir John as the potential basis of a large chemical industry within a decade.

Scientific Copyright

AN important sequel to the scientific information conference organised by the Royal Society last year is the declaration published recently by the council of the society stating that it will regard certain copying from its own publications as "fair dealing," and inviting other societies and publishers to subscribe to a similar document. The problems of the library or information service have been considerably complicated with the advent of cheap photocopying processes by the necessity of obtaining individual permission from the copyright holder whenever a photo-copy was made. While refusal

of such permission seldom occurred, many agencies in this country were bound by the letter of the law and would not undertake to supply photographs or other photographic copies of papers to individual scientists without obtaining the holder's consent. In making this declaration the Royal Society is, therefore, setting an example which it is hoped will be followed by all those concerned with the publication of scientific periodicals in which original papers appear. The declaration states: "We will regard it as fair dealing for the purpose of private study or research when a non-profit making organisation, such as a library, archives, office, museum or information service, owning or handling scientific or technical periodicals published by us, makes, and delivers a single reproduction of a part of an issue thereof to a person or his agent, representing in writing that he desires such reproduction in lieu of a loan or manual transcription and that he requires it solely for the purpose of private study, research, criticism or review, and that he undertakes not to sell or reproduce for publication the copy supplied, provided (1) The recipient of the copy is given notice that he is liable for infringement of copyright by misuse of the copy and that it is illegal to use the copy for any further reproduction; (2) the organisation making and furnishing the copy does so without profit to itself; (3) proper acknowledgement is given to the publication from which the copy is made; (4) not more than one copy of any one excerpt shall be furnished to any one person." The

declaration has been made for an experimental period of two years, and so far more than seventy publishing bodies have subscribed to it.

Popular Exposition

ROYAL Society policy represents a specialised and more obviously important aspect of the aim being furthered by the 111th meeting of the British Association in Newcastle this week, and one in which UNESCO is taking a lively interest in its wider field. The international body believes it is its duty to make scientific knowledge more available to everyone. In short, the popularisation of science, which in fact requires no popularising, but only wider exposition in a form which is intelligible and does not misrepresent the true objectives. That project is perhaps more urgent than it may appear to those who observe that science in the past has never found itself retarded because of lack of popular understanding. Lavoisier's audience in the entire world was probably fewer than those comprising one university chemistry department in 1949. It seems to be agreed today that science, disposing of considerably more public funds than ever before and with a much more intimate relationship with individuals, is everybody's business. Sir Richard Gregory has lately taken the lead in appealing for the collaboration of science writers with UNESCO. Many in his view, are now qualified for the rôle of popular expositor, but the scope offered by the paper-starved general Press does not offer much encouragement.

STANDARDISING SCIENTIFIC TERMS

(continued from page 306)

engage in laborious, time-wasting conversion calculations.

Standardisation of units and nomenclatures will also help in achieving greater quantity and variety of products. As one of the first steps towards this desirable state it will devolve upon all who are concerned with scientific and technological publi-

cation to introduce the new units and to adhere to them.

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U.S. CHEMICAL EXPORTS

New High Record Total

THE value of exports of chemicals and allied products from the U.S.A. in the first six months of 1949 reached a new high level, totalling \$450,432,000, suggesting that the year's total may constitute a new record of \$900 million. Exports in the first quarter were valued at \$226,432,000 and in the second quarter declined slightly to \$224 million. This was probably due to generally lower prices for chemicals and not to a decrease in physical volume. The first quarter total was exceeded only by the \$238,557,000 exported in the same quarter of 1947, and included:—

Coal-tar products	\$28,797,000
Chemical specialties	\$42,916,000
Industrial chemicals	\$35,778,000
Paints, pigments, and varnishes	\$22,156,000
Fertilisers	\$22,855,000
Explosives	\$2,508,000
Naval stores, gums and resins	\$7,985,000
Linseed, essential and aromatic oils	\$2,918,000
Dyestuffs and tanning extracts	\$213,000
Sulphur	\$7,638,000

Coal-tar products and industrial chemicals in the January to March period showed large increases over the previous quarter. Exports of chemical specialties were down slightly from the record total of the second quarter of 1948. Industrial chemicals, which reached a record of \$45,089,000 in the third quarter of 1947 and dropped steadily thereafter, reversed this trend in the first quarter of 1949.

Europe maintained its lead as the best market for American chemicals, buying \$66 million worth in the first quarter. North America bought 26 per cent of the total, and Asiatic countries almost equalled that percentage. South American countries retained fourth place.

Canada imported \$29 million worth or 13 per cent of U.S. total chemical exports in the first quarter. Mexico was the second best customer, Cuba the third, and the Dutch West Indies fourth.

Among countries in Asia and the Far East, the Philippines took the lead as America's best customer, followed by Japan which ran a close second. India, which had been the best buyer in 1948, dropped to third place, probably as a result of that Government's strict import licensing.

UNIFIED SCREW THREAD

The International Programme

REVIEWING the recent three-day Paris meeting of the International Standardisation Organisation, the American Society of Mechanical Engineers reports that a favourable start towards unification of the various national standards on screw threads was made. Delegates from 15 of the 18 countries agreed to recommend the recently established unified Anglo-American screw thread to their national standardising bodies as the common profile for the metric and inch systems of screw threads.

Participating Countries

Sweden acted as secretariat for the participating countries. They were Great Britain, U.S.A., France, Russia, Poland, Belgium, Canada, Denmark, Finland, Portugal, Hungary, Israel, The Netherlands, Norway, Switzerland, Czechoslovakia, and Italy.

Russian delegates, casting the only negative vote, had come to the meeting instructed to support the Zurich 1939 profile, somewhat similar to the unified Anglo-American screw thread. Czechoslovakia abstained from voting, while Italy agreed to recommend the Anglo-American thread for the inch system of screw threads only.

The vote on the Anglo-American thread was one of five resolutions adopted.

A sub-committee was established to define the scope of the Technical Committee, known as ISO-T1. It was decided that the unified Anglo-American screw thread would be referred to as the "ISO Basic Profile."

The programme of work for the Technical Committee will be concerned with threads for bolts and nuts with triangular profile smaller than 6 mm. diameter; 6 mm. diameter and larger; and constructional threads with triangular profile 6 mm. diameter and larger. In each case the committee will be concerned with profile, diameter, pitch series, and preferred diameters and pitches. It will also deal with threads with profile other than triangular.

The scope of the Technical Committee was defined as: "the establishment of a series of internationally interchangeable screw threads covering the technical requirements in various fields of application with a minimum variety of basic profiles, pitches and diameters. The unification of American and British pipe threads is not included in this scope."

PALESTINE OIL AND POTASH

Conflicting Accounts of Development Prospects

REPORTS that the Israeli Government had issued, in one case, an ultimatum, and in another, a warning of nationalisation to industries which have been at a standstill for about 15 months were denied last week.

The staff at the Haifa oil refineries, owned by Consolidated Refineries, Ltd., stated that no ultimatum to the effect that the plant should be reopened within four months had been received from the Israeli Government. The British staff was unwilling to act on its own initiative to operate the refineries or hand them over to other staff. Decision would have to come from the London offices and the British Government. The refineries have an annual capacity of about 4 million tons of finished product.

Official Reassurance

The second statement was by the Israeli Government, asserting that there was no truth in the report that it intended to expropriate and nationalise the Sdom potash works at the southern end of the Dead Sea. The Government is said, however, to have advised the British-owned Palestine Potash Company, in view of the inadequacy of its resources, to participate with financially powerful groups, probably American, interested in the large-scale exploitation of the Dead Sea's mineral wealth.

A ministerial committee which recently investigated the mineral prospects of the Dead Sea has accused the Palestine Potash Company of "neglecting adequately to exploit the country's greatest source of mineral wealth." The sea is said to contain magnesium chlorides and other minerals, still commercially unexploited.

Charges Denied

Evidence suggesting that the recent critical statement about Palestine-Potash, Ltd., did less than justice to the company is contained in a letter to *The Times* (August 27) by the managing director of the company, Mr. M. Novomeysky.

He deals with the reported dissatisfaction of the Israeli Government with the company's reputedly small output, that it had extracted "only 100,000 tons of potash since the work began in 1930 and an infinitesimal quantity of bromide" and that other minerals had been neglected.

"The actual figures," writes Mr. Novo-

meysky, "are as follows:—Potash produced up to the end of 1947, 1,040,000 tons; bromine produced up to the end of 1947, 8200 tons. Latterly exports of bromine have been reduced owing to high freight charges and increased production in the United Kingdom.

"It is correct that the Dead Sea contains unlimited quantities of magnesium chloride, but several efforts to start production of magnesium metal before the war had to be postponed in view of the very small world consumption. From 1935 to 1938 an average of only 2000 tons was produced in the United Kingdom, and 4800 tons was the American production in 1939.

"Large-scale production of magnesium metal began only during the war. At the outbreak of the war the company was in negotiation with the Air Ministry and the Ministry of Aircraft Production for erecting a plant on the Dead Sea, and negotiations had reached an advanced stage early in 1940. The Government expressed their interest in the company's proposal, and were prepared to bear the cost of the plant. Italy's entrance into the war, however, which resulted in closing the Mediterranean, brought negotiations to a standstill.

Seeking New Finance

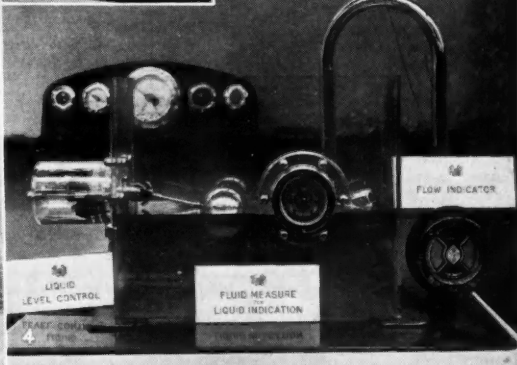
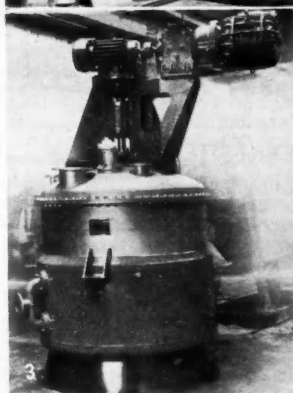
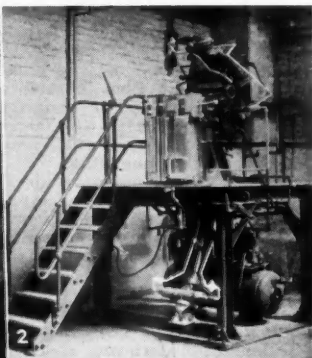
"It is well known that after the war production of magnesium reached such a stage that many of the plants here and in the United States had to close down. Full details were given in a White Paper issued in 1944. Those who have followed closely the company's activities have often expressed their appreciation of the progress achieved notwithstanding the adverse conditions in Palestine since the 1936-38 disturbances, followed by the difficult war years and the unsettlement since.

"It is correct that with the authority of my board I am in negotiation in the United States as well as in this country for financing jointly the resumption of work on the Dead Sea on a larger scale."

S. Rhodesia Exploiting Kaolin

Large deposits of kaolin, occurring within 20 miles of Salisbury, are now being opened up and will be used, at first, for the local manufacture of fire-proof ceiling board.

Chemical Plant at Olympia



REPRESENTATIVE of the increased representation of chemical processing plant are these examples seen this week at the Engineering and Marine Exhibition at Olympia, London, W.1. 1. The Metaducts exhibit reflects principally the current interest in large stainless steel processing vessels for chemicals, oils and foodstuffs. 2. Combined melting and mixing plant in jacketed stainless steel showing advanced use of power and steam applications. (Thompson Bros. (Bilston), Ltd.). 3. A 500-gallon jacketed still, lined with stainless steel and fitted with power turbine impeller (Thompson Bros. (Bilston), Ltd.). 4. Part of the display of fluid measure and liquid level control by Bayham, Ltd. 5. The wide usefulness of silicone materials, as gaskets and lubricants, impervious to temperature change, illustrated on the stand of Albright and Wilson, Ltd.

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Growing Capacity of French Industries

Monnet Plan Favours Chemicals and Metals

GOOD progress has been made under the Monnet Plan in some sections of the French chemical industry. Some evidence of this is contained in the recently issued fourth half-yearly official report, to December 1948.

Among outstanding achievements in this progress are: new electrolytic plant at Pont-de-Claix (Isère), securing power economy of about 20 per cent; increased capacity of sulphuric acid plants, especially by the contact process and including reconstruction of the Granville works using the new Katchkaroff method (H_2SO_4 and HNO_3); four new plants for carbon disulphide; modernising of superphosphate works, including a new one at Rouen; improved equipment of potash mines; increased production of antibiotics at Vitry—streptomycin is being produced this year; increased manufacture of plastics, and the extension of the works at Montluçon for making vinyl chloride; and establishment at Saint-Auban (Basses-Alpes) of a technical centre.

The total nitrogen needs of France and of French overseas territories for 1952/3 have been estimated at 450,000 tons, towards which home-manufacture will afford 350,000 tons. It is considered that, taking into account present plant efficiency and losses in conversion to finished fertilisers, total capacity in 1952/3 should be between 465,000 and 540,000 tons.

Since the beginning of 1947 annual capacity increase has been about 24,000 tons.

The total cost of extensions of coke and gas plant in 1948 was rather more than Fr. 6000 million. Output of metallurgical coke by 1952 should be 10.2 million tons, as compared with 7.6 million tons in 1938. New installations include 443 new coke ovens at the mines and 304 metallurgical coke plants with total capacity of nearly 1000 tons per day and several new gas works, with piped supply.

Important research work is being undertaken in the gas industry, especially in connection with the coking of Lorraine coals, at Thionville, Carling and Marienau. These coals hitherto have been used only to the extent of about 50 per cent, mixed with other better quality coking coals. It is hoped now to raise the lower-grade proportion to 80/85 per cent.

In the cement industry the pre-war capacity of 8 million tons—which was not fully utilised—is thought sufficient for the near future. Attempts are being made to increase efficiency and fuel economy, there is to be general modernisation and the manufacture of slag cements is to be increased. Total expenditure for development in 1948 was Fr. 2200 million, compared with Fr. 600 million in 1947. This expenditure included Fr. 190 million for imported plant, mostly from the U.S.A.

In the department of non-ferrous metals, the electrolyte zinc works of Viviez (Aveyron) has been enlarged, while the thermal zinc works of Auby (Nord) have not yet progressed much beyond the preparatory stage. The same applies to some of the aluminium works extensions. On the other hand, increased production of ferro-chrome has enabled imports to be reduced. (*Chim. and Ind.*, 1949, 62 (7), 82-88.)

REFRESHER COURSE

APPRECIATING the importance of works and plant engineers as key men in every industrial development and the consequent need that they should be fully abreast of current technology, Incorporated Plant Engineers has inaugurated in its South Western region a refresher course for these essential personnel. It will comprise 26 addresses by specialists in each field drawn from industry in different parts of the country. There is to be one 2-hour evening session each week, one hour for the address and the second hour devoted to intensive discussion.

The syllabus covers the following subjects: Combustion and steam raising; steam utilisation; distribution and utilisation of electricity; mechanical transmission of power; lubrication; refrigeration plant; compressed air plant; pumping plant; instrumentation of plant; planned maintenance. Meetings will be at the Bristol College of Technology in collaboration with the University of Bristol. Although the course is intended primarily for works and plant engineers in the South Western region, it will be open to engineers and students from any region. The secretary to the course is at 12-14, Apsley Road, Clifton, Bristol, 8.

The Study of Reaction Kinetics

Light on the Nature of Chemical Change

by Sir ALFRED EGERTON, F.R.I.C., F.R.S.*

THE study of slow oxidation and ignition has in recent years provided a most prolific field of inquiry, which has enriched chemistry by the kinetic approach in distinction to the thermodynamical approach of the latter part of the last century.

Such studies have had their repercussions in other directions; for instance, in the chemistry of polymers, the building of large molecules from small units, which has been much to the fore recently, not only because of its technological importance in the plastics, paint, rubber, textile and other industries, but for its own scientific interest.

Polymerisation and depolymerisation are influenced by oxidation: the oxidation may not only influence the rate, but may change its course. Oxidations in the liquid state are subject to similar chain reactions as occur in the gaseous state. It seems to be becoming generally agreed that in all these oxidations, the initial steps are dependent on peroxidation.

Peroxide Formation

The reacting molecule is first shaken by collision or otherwise, so that a hydrogen atom becomes detached, oxygen steps in and forms a peroxide radical which on encounter with another molecule, gives a peroxide, or if this is not stable enough to exist, the resulting complex breaks up into simpler components.

Even the oxidation at low temperatures of a solid like carbon is preceded by formation of peroxidic complexes on the surface. In fact, there seems to be some underlying theme of this kind common to combustible substances from which nature constructs a symphony of behaviour of great variety.

In the oxidation of quite a simple hydrocarbon such as n.octane, the stages of breakdown may involve the formation of a number of different peroxides, but it is not so much their formation but the manner of their break-up that determines the main course of the oxidation. The influence of inhibitors and promoters on

the oxidation, which has been of importance in the study of "knock," is linked with the formation and stability of these peroxides.

There should be connection here with biological processes of oxidation and polymerisation which occur at normal temperatures in the presence of catalytic agents, such as glutathione or co-ordinated metal groupings, and one feels that in this field there is much yet to discover.

Nowadays, chemists do not accept the mere existence of atoms, radicals and molecules; they have to consider them as electrodynamic systems subject to quantum dynamical laws, described in terms of atomic and molecular orbitals, and subject to patterns of behaviour determined by shift of electron density.

A Productive Field

The study of reaction kinetics, which includes combustion and oxidation, has had a great influence towards this closer understanding of the true nature of chemical change, and this in turn has had its effect in advancing knowledge of molecular structure and reactivity.

It has not been my intention to review the great advances in chemistry made in the last 20 years, but I have intended to point out the connection it has all had with the study of combustion. The effect can be seen in other directions.

I have already mentioned that important work was done on the chain theory of reactions in Bohr's laboratory in 1923; it was to the fore there again when the possibility of propagating nuclear fission by chain reactions of fission products came to be considered.

The consequences of this to the world have been terrific. At all events, chemistry has been enriched by the filling of all the gaps in the periodic classification of the elements (43, 61, 85, 87), the provision of a new set of transition elements of atomic number greater than uranium (93 to 96) and large numbers of isotopic elements, stable and unstable, which provide further means to trace where and how reactions occur.

The combustion chemist is usually concerned with rapid reactions because of the many practical problems involving

* Abstract from the speech of the chairman of Section B—Chemistry proceedings at the annual meeting at Newcastle-upon-Tyne of the British Association for the Advancement of Science (August 31 to September 7), in the course of which he gave a comprehensive review of the work of the chief contributors, past and present, to current knowledge of combustion chemistry.

detonations, explosions or flames. It is not easy to trace what happens in these very fast reactions.

In slow combustion, from pressure change and determination of the substances formed, it is possible to understand what is happening and even to predict when, by branching or self heating, the mixture will trigger over into an explosion and ignite.

A very complete study of the hydrogen and oxygen reaction has been made in this way by Hinshelwood and his school. But to determine just what happens in an explosion or in any very rapid reaction associated with flame is not an easy experimental problem.

Polanyi, however, showed how it was possible to study fast reactions in flames at low pressures. His were sodium vapour flames burning in halogen or alkyl halides, and from the limit of the ambit of the sodium as found by its fluorescence, it was possible to determine the course of a reaction and the effectiveness of the collisions for reaction between the atoms and molecules.

Gaydon and Wolfhard in my department at South Kensington have been able to maintain stable hydrocarbon flames at quite low pressure. The zone of the flame reaction can be spread into quite a wide band, as the free path of the molecules is appreciable.

The position where the various radicals, which emit light, commence to show themselves and their temperature can be found. Although one cannot get the whole story in this way, much about these fast

reactions can be discovered. It is possible also to freeze out suddenly and analyse the products formed in a flame and so get further information about the processes; this is another line which Minkoff and Everett have been investigating in our laboratory.

Others—Coward and workers in the Safety in Mines Laboratory, Laffitte and others in France, Stevens, B. Lewis and G. von Elbe and others in America, Linnett, Boys and Corner, recently in England, have advanced our knowledge of flame propagation.

In ordinary flames, it seems that the propagation is maintained by the diffusion back into the unburnt gas of some of the radicals from the flame, rather than by the self-acceleration of the ignition reactions in the unburnt gas alone.

There may thus be a distinction between inflammation, which determines flame propagation, and ignition. Nevertheless, when the gases can be self-heated quickly at low temperature, inflammation may become a double process (involving self-ignition and subsequent inflammation), as Townend has shown with ether and acetaldehyde.

We are having a discussion about flames later and I only refer to this aspect of combustion chemistry as the subject of my address would be incomplete without some mention of it, and this ends my review of the influence which the study of combustion has had on the progress of chemistry; all along great technical developments have closely followed this growth of knowledge.

Fuel Technology Courses

MANY practical aspects of fuel technology are to be dealt with by authorities in the lecture course to be given at 7 p.m. on Tuesday evenings during the winter session, commencing October 4, at the Northampton Polytechnic, St. John Street, London, E.C.1.

Lecture subjects include "The Preparation of Synthesis Gas from Coke and Brown Coal by the Fischer-Tropsch Process"; "The Behaviour of Coal on Heating"; "Recent Developments in the Analysis and Testing of Solid Fuels"; "Liquid Fuels, Their Characteristics and Utilisation"; "Radiant Heating by Town Gas for Industrial Processing."

There is also to be a lecture course on "Ceramics, their Production, Testing and Utilisation," on Wednesday evenings at 7 p.m. Fees are: Full technology course, 30s., ceramics, 21s.

Foundry Steel Melting

TECHNICAL and economic aspects of the various processes of foundry steel melting will be discussed at a conference organised by the steel castings division of the British Iron and Steel Research Association to be held at Ashorne Hill, Leamington Spa, on Thursday and Friday, September 22 and 23.

The chair will be taken by Mr. Richard Lamb, research metallurgist.

Following the same procedure as on the three previous conferences, this year's meeting will consist of four sessions, two on each day, thus allowing ample time for discussion of the papers presented.

The four sessions will cover the cupola/converter process; electric arc process; other melting processes, and general items.

Applications for accommodation should be made to the steel castings division of the BISRA.

MEASURING DISINTEGRATION RATES

American Work on Sodium 22

THE creation of radioactivity standards and the use of radioactive isotopes as biological tracers calls for knowledge of the number of atoms disintegrating in each unit of time. One way of determining this, for radioactive substances emitting both beta and gamma radiations, according to continuing research at the U.S. National Bureau of Standards, is to count the beta and gamma emissions that occur simultaneously.

For most radioactive substances this can be done with an experimental arrangement consisting only of a radioactive source, a beta-ray counter, and a gamma-ray counter. But in the case of sodium 22, decaying to neon 22, the measurement problem becomes more difficult because each atom of sodium 22 disintegrates by emitting a positron instead of the usual electron.

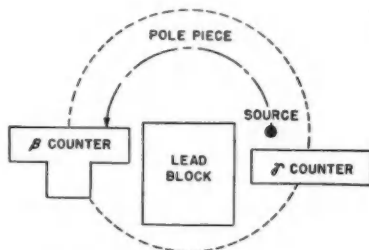
In order to overcome this difficulty, workers at the Bureau of Standards have used a coincidence counting arrangement in which the beta and gamma counters are separated by a lead block and are placed in a moderate magnetic field. The radioactive source is placed near the gamma counter so that positrons emitted by the source will travel, under the influence of the magnetic field, in a semicircular path around the lead block to the beta counter. The lead block effectively prevents the annihilation radiation produced near the beta counter from reaching the gamma counter and causing false coincidences.

Gamma Counters

Gamma counting rates were determined with two different gamma counters, observing the gamma rates for each counter with and without an aluminium cover over the source. The two gamma counters were the same shape and size, differing principally in relative counting efficiency for low-energy radiation.

The difference in efficiency was caused by using different outer electrode materials—copper in one counter, platinum in the other. The aluminium shield was placed over the source to increase the amount of annihilation radiation. The aluminium does not, however, appreciably affect the number of nuclear gamma rays reaching the counter.

The results of the four experiments yield the information needed to determine (1)



Coincidence counting arrangement

the true counting rate for 1.3 million-electron-volts nuclear gamma rays, (2) the counting rate for 0.5 million-volt annihilation gamma rays, (3) the relative efficiency of the two counters for 1.3 million-volt nuclear gamma rays, and (4) the relative efficiency of the two counters for 0.5 million-volt annihilation gamma rays.

The true nuclear gamma count combines with the beta count and the beta-gamma coincidence rate to make possible the computation of the absolute disintegration rate of sodium 22. If the number of atoms disintegrating per unit time is designated as N , the number of counts produced in the beta counter will be Np , where p is the probability of a beta ray entering the counter and being counted. Similarly, the true number of nuclear gamma counts is represented by Nq , where q is the corrected probability obtained by using two gamma counters, each with and without an aluminium screen over the source.

The probability of both the beta and gamma counters responding to radiation resulting from the disintegration of a single atom is then the product of the respective probabilities, so that the number of genuine coincidences per unit time is Npq . The counting rate, Np , Nq , and Npq , then gives three equations in three unknowns, readily solved for the disintegration rate N as well as the probabilities p and q . The disintegration rate for the radioactive sodium chloride solution used in these experiments at the bureau was shown to be 2.69×10^4 disintegrations per second per millilitre.

(continued overleaf)

Energy Requirements of Liquid Ammonia

Standard Calculations by Montecatini Workers

IN a paper presented at the Congress of Industrial Chemistry, Brussels, last year, and now published (*La Chim. e l'Ind.*, 1949, 31 (6), 183-187) F. Tredici and S. Pontelli, members of the Montecatini research staff, Milan, describe methods of analysing and calculating the energy used in the production of liquid ammonia.

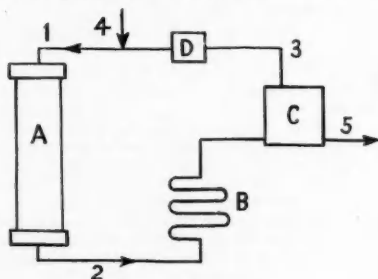


Fig. 1

The various synthetic processes according to equation $N_2 + 3H_2 = 2NH_3$ differ essentially in the pressures used; but all except that of Claude which is not considered here, may be represented by the scheme diagrammatically shown in Fig. 1, in which A is the catalyst tower, B the condenser, C the separator, and D circulator of unreacted gases.

The gas mixture passing through A emerges with an ammonia content, part of which is condensed in B, thence into separator C. It passes out at 5 as a gaseous and liquid mixture. The separator may, of course, be of varied form and function.

The mixture passing at 3 goes into recycler or circulator D, and thence again into the catalyst tower. At 4 enters the mixture from the compressors in quantity sufficient to balance effluent at 5 and circulation losses. Sometimes it enters at other points in the cycle.

Given the cycle shown in Fig. 1, it is required to determine variations of energy consumption for production of liquid ammonia under pressures ranging from 300 to 800 kg./cm.². Energy is required for (a) compression of gas mixture, (b) circulation, and (c) condensation. Comparisons are made on the basis of one ton produced.

Equations and graphs are given for each of these, from which it is shown that by far the greater part of the energy consumed is for compression of the gas mixture. From this point of view, i.e., of energy used, the high percentages of ammonia formed in the synthesis column under high pressure are relatively unimportant, since they only reduce by a few kWh the energy required for circulation.

The results are summarised in graph form. Theoretical energy consumption for compression was determined, and to complete the data required it is necessary to have compressor yields and number of phases. Supposing that the total yield of the compressors with adiabatic compression is 70 per cent and the phase numbers as follows:—

for 300 and 400 kg./cm. ²	5 phases
„ 500 and 600	„ 6 phases
„ 700 and 800	„ 7 phases

then the following are energy consumptions for compression of the mixture:—

pressure:	kg./cm. ²	300	400	500	600	700	800
energy kWh		824	886	930	987	1020	1065

MEASURING DISINTEGRATION RATES

(continued from previous page)

The efficiency of the platinum counter used in the bureau's work was found to be practically equal to that of the copper counter for 1.3 million-volt gamma rays, but 2.9 times as large for 0.5 million-volt annihilation radiation. When the source was covered with 1/32-in. aluminium, the counting rate for annihilation quanta increased by 25 per cent. When the copper-electrode counter was used to measure the radiation from sodium 22, about 70 per cent of the total gamma counts were due

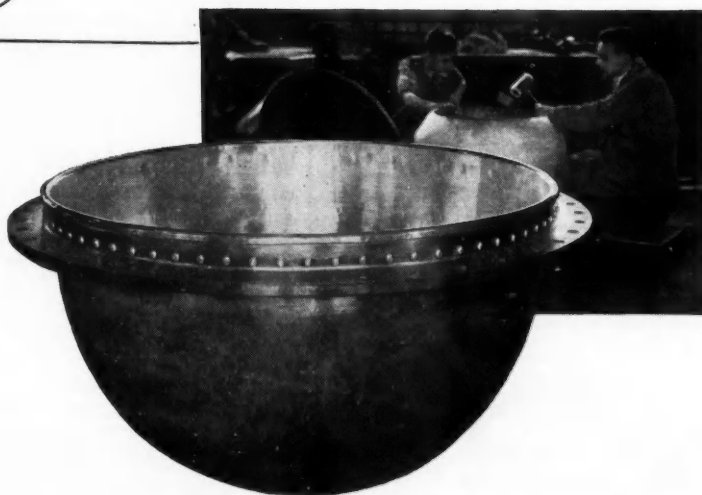
to nuclear gamma rays and 30 per cent to annihilation radiation.

The results obtained in this work on sodium 22 at the bureau agree to within a fraction of 1 per cent with the results of an independent method using electrometer measurements against a known radioactive standard. The bureau's new method for the calibration of positron emitters promises to be quite useful, especially since sodium 22 in the form of sodium chloride offers interesting possibilities for use as a biological tracer and as a gamma-ray source in medical therapy.

Metallurgical Section

Published the first Saturday in the month

Silver and fluorine



Silver is used extensively for the manufacture of equipment to handle fluorine and its compounds. For certain services it is preferable to any other constructional material.

The solid silver pan illustrated is 3 ft. 6 in. in diameter and is used for the evaporation of a fluoride solution. It is typical of the work in silver undertaken in the Johnson Matthey workshops.

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Metallurgical Section

3 September 1949

MAGNETIC FLUIDS

Metal-Chemical Basis of a New Mechanical Principle

JUST over a year ago the National Bureau of Standards, Washington, published the first account of some experimental work done by J. Rabinow on the properties of magnetic powder suspensions in oil.¹

The object was to develop a magnetic fluid clutch in which the frictional effect would be produced by coagulating the suspended metal particles through induced magnetism. The laboratory results were most encouraging, and the idea was taken up immediately by the Servomechanisms laboratory of the Massachusetts Institute of Technology and at least one of the major American automobile concerns. The National Bureau of Standards also continued its work, and a comprehensive summary of it is contained in a paper presented by H. D. Saunderson to the fifth annual meeting of the U.S. Metal Powder Association in Chicago last April.²

Carbonyl Iron Powder

The technical problems which arise in a magnetic fluid clutch are extremely interesting. There is, first of all, the powder. Carbonyl iron powder has proved most efficient out of a large number of powdered magnetic materials, owing to its optimum combination of permeability, resistance to corrosion from the oil, resistance to attack by oxygen and moisture, and its dispersing properties. Fine particle size is not entirely desirable for magnetic reasons, because the particles in the suspension, when exposed to a magnetic field, set up their own magnetic fields which act somewhat analogously to the counter e.m.f. in an electric motor. The most promising results have been obtained with powders of 40 microns size.

A whole range of fluids has been tried. The properties required are that the fluid should be inert towards the powder, that it should be thermally stable over a wide temperature range, that it should exhibit a minimum change in viscosity, and be capable of maintaining the powder in suspension, either alone or with a suitable

additive. The trifluoromonochloroethylenes appear to be most useful, but above 230° C. they give off toxic vapours which necessitate very good sealing. Methyl-phenyl silicones are also useful up to the same temperature, after which decomposition occurs.

Additives may be required to obtain either thixotropy or wetting of the particle surfaces. Butyl oleate may be used up to 150° C. for producing thixotropy, though the basic fluid is not specified. Among the surface-active agents that have successfully wetted the magnetic particles at temperatures up to 90° C. are substances such as *p*-dichlorobenzene, dioctyl sodium sulpho-succinate, etc.

In addition to the Chrysler Corporation which appears to have made the largest magnetic fluid clutches in existence so far, the General Electric Company in America has also been active in this field and is stated to have built clutches with torques ranging from 0.2 in./lb. for tension devices up to 160 in./lb.

One interesting development in this work of the General Electric is the abandoning of the oil medium altogether in favour of graphite. The graphite apparently coats the particles, and the results obtained with these dry clutches are claimed to be superior to those obtained with oil suspensions.

All the difficulties have by no means yet been solved, but the National Bureau of Standards is continuing its study of magnetic fluids also for other purposes than clutches.³ Some laboratory work is being done to test the possibilities of magnetic fluids as shock absorbers for remote control in a hydraulic system, as a low temperature casting mould material, and also as a variable electrical resistance material.

REFERENCES

- ¹ Nat. Bur. Standards, *Tech. News Bull.*, 1948, 32, 54-60.
- ² Proc. Fifth Ann. Meeting, Metal Powder Assn. (N.Y.).
- ³ Nat. Bur. Standards *Tech. News Bull.* 1949 33, 74-76.

Mg. ALLOYS APPRAISED

Some New Conclusions from U.S.A.

A COMPREHENSIVE survey of the mechanical properties of some 200 alloys in 40 magnesium alloy systems suggests that magnesium-zinc-silver-manganese-calcium is the most promising combination for further study and development, according to a new report, "New Magnesium Alloys," just released by the U.S. Office of Technical Services.

The study, undertaken by the Rennselaer Polytechnic Institute for the U.S. Air Force, disproves certain favourable assumptions which had previously been made regarding the high mechanical strength and good workability of the German Giesche alloy. It also shows that the addition of 5 per cent each of the intermetallic compounds Cd_2Ni_3 , Cd_2Cu , and Cd_2Sb , failed to improve the mechanical properties of magnesium and magnesium-zinc base compositions.

Ductile Alloys

A preliminary investigation of warm rolling procedures for dilute magnesium-base alloys indicated the possibility of increased ductility and toughness with moderate strength properties through these methods, although the data were too limited in scope to draw specific conclusions.

Further study of the magnesium-zinc-aluminium-tin system agreed with earlier results indicating that magnesium-5 zinc-3 aluminium-3 tin was the best combination of this particular system.

The promising magnesium-5 zinc-1 silver-1.5 manganese-0.3 calcium alloy still has the drawbacks of hot-shortness (tendency to break under stress when being handled under high temperature) and extreme sensitivity of its mechanical properties to small variations in composition and handling procedures.

Copies of the new Report, No. PB-97657, "New Magnesium Alloys" (243 pp.) can be had as a photostat costing \$81.25, or as a microfilm at \$9.00, from the Library of Congress, Photoduplication Service, Publication Board Project, Washington 25, D.C.

French Contract in Brazil

Material and equipment for the oil refinery to be constructed in Brazil (capacity of 45,000 barrels a day), will be supplied by a French combine and the erection will be supervised by Hydrocarbon Research, Inc. (U.S.A.).

STAINLESS STEEL WIRE

New U.S. 500 Tons-a-month Mill

A NOTHER step has been taken in its \$900 million development and modernisation programme by the United States Steel Corporation, through its subsidiary company, the American Steel and Wire Company, by the opening of a new stainless steel wire mill at Waukegan, Illinois, with a capacity of 500 tons per month. The new plant covers 100,000 sq. ft. under one roof.

In rolling the metal for stainless steel wire, careful pyrometric control is found to be necessary, and rods are best produced slowly from billets as small as possible. Each coil averages about 170 lb., and, by a process claimed to be new to the industry, one coil is flash-welded to another to form bundles, each weighing 500 lb. Then new-type "compressors" squeeze two of these bundles together to make one compact, round 1000-lb. parcel.

Further steps in the process include spot cleaning, in which oxides are "burned off" by a caustic method using molten salt and successive baths of acids and water. One of the most important and complicated jobs is to anneal the stainless steel before it is drawn into wire to permit its smooth passage through the diamond dies. Two large and one small rotating furnaces are used for this purpose at the Waukegan plant.

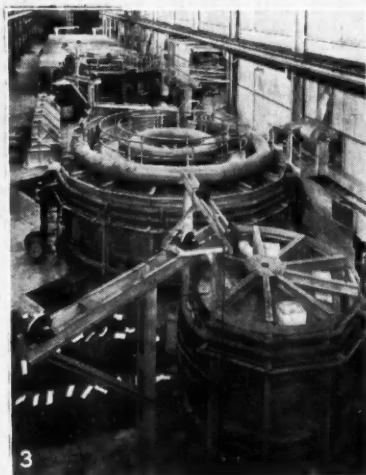
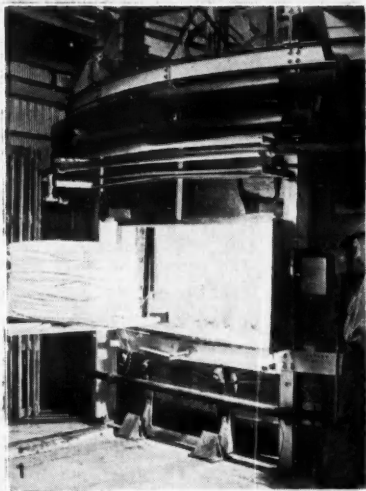
The company uses a new type of coating to protect the wire as it is drafted down into finer sizes. Sometimes the wire gets a copper coating, not for greater rust-proofing, but to act as a lubricant when the wire goes into a machine that cuts threads and forms a head, as for example with nuts and bolts.



Some key processes in the new Waukegan plant are depicted on the facing page.

1. 1000 lb. of stainless steel rod leaving one of the rotary electric hearth furnaces (2000° F.).
2. Specially designed for space saving in the wire drawing process, these drawing blocks, powered from below, offer differing drawing speeds and power, the largest employing up to 60 h.p.
3. The "craneman's view," embracing the weighing and welding section, storage bins of 500 tons capacity and the rotary annealing furnaces.
4. Some of the machines which draw the finer gauges, down to .014 in. diameter, at rates varying between 300 and 900 ft. per minute

Rapid Heating and Wire Drawing



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ELECTROLYTIC IRON POWDER

Summarised Results of Recent Russian Work

IN Zhurn. Prikladn. Khim. for March, 1949, 22, 312-318, L. L. Kuzmin and V. L. Kiseleva describe the electrolytic production and properties of iron powder.

In a previous note on the preparation of the powder by reduction of iron oxide with hydrogen at a high temperature (*loc. cit.*, 1948, 21, 378) it was stated that such a method (reduction) involved the disadvantage of re-crystallisation, leading to coarsening or agglomeration of particles and reduced capacity of the iron electrode. It appeared, therefore, of interest to study a method of obtaining active iron by electrolysis in which re-crystallisation was not likely to occur.

Belger had already tried this method with high current density to obtain sponge iron. But, despite the fairly extensive literature on electrolysis of iron, this method appears to have received little attention.

Metallo-Ceramics

Balshim has studied the possibility of electrolytic methods in connection with metallo-ceramic purposes (Collected Works of NIIMASH, 1935, 12, 5), and gives optimum conditions as follows: electrolyte FeCl_2 of 30 g./lit. concentration with NH_4Cl of 100 g./lit., cathodic c.d. 10 amp./dm², and temperature 30° C. These are similar to those specified in the A.E.G. German Patent No. 316,748.

The cathode deposit was removed by washing once per 24 hours, dried at 50° C. under vacuum (100 mm. Hg), and finally reduced in hydrogen at 750° C. The resulting powder had a purity of 99.7 per cent, passed a sieve of 100-150 mesh, and had pouring weight of 2. Powder of greater fineness tends to oxidise readily, and is unsuitable for the metallo-ceramic industry, but may be suitable for accumulators.

Special interest, however, attaches to a method of producing the iron powder without supplementary disintegration and reduction in a hydrogen atmosphere.

In the experimental work described in the Russian work the conditions of test varied as follows: concentration of electrolyte, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 10-300 g./lit., pH 1.5-4.2, cathodic c.d. Ds, 0.001-2 amp./cm², and temperature 15-80° C.

The purity of materials was assured and iron sulphate was prepared as described in the earlier work (*loc. cit.*). Anodes

were of Armco iron, and cathodes of chrome-nickel steel, with which the formation of nickel oxide on the surface facilitated the removal of deposited iron (Müller, etc., *Zt. f. Elektrochem.*, 1941, 47, 135); and also aided formation of deposit.

The dependence of results on c.d. and pH are graphed in five curves (pH as ordinates), with varying concentrations, and all at room temperature, except the fifth, which was 80°. The five different curves are: (A) iron sponge or powder, (B) dendrite, (C) dendritic on edges of electrode, (D) weak adherence of base metal, and (E) denser and more strongly adherent deposit.

Generally, it is concluded that increased concentration of electrolyte and higher temperature reduces the occurrence of broken or disintegrated deposit; but the introduction of sugar or glycerine into the solution, on the other hand, increases the disintegration of the deposit and the difficulty of removing it from the electrode, as well as periodical cleaning of the latter. Addition of large quantities of sodium and magnesium sulphates when working with high c.d. induces deposition of hydrated iron oxide.

The nature of the broken-up deposit varies, of course, with the conditions of electrolysis. With more acid solutions, grey dendritic metallic deposits more readily form. Reference may be made here to the case studied by Kassube and Schmellenmeier (*Zt. f. Elektrochem.*, 1941, 47, 309).

Dendritic Deposits

These deposits tend in time to consolidate, although they still contain an appreciable amount of inclusions in the form of air-holes or blisters, the precise extent of which is difficult to define (Burmeister and Schlöter, *Metallwirtsch.*, 1934, 13, 115). The use of these dendritic deposits for active iron electrodes without further pulverisation is not possible.

In conditions of low acidity and high c.d. the deposits tend to become coarser at first, then somewhat finer, and in certain known and recognised cases they are spongy or sludge-like, readily oxidising not only in air but also under water. Cathodic deposition may be complicated by a number of unwanted effects and in normal working it is necessary to remove

evolved oxygen, prevent oxidation of Fe^{2+} at the anode, and ensure sufficient and continuous acidity of electrolyte.

Such conditions may be secured by working with small anodic c.d. Polarisation curves are given showing that evolution of oxygen begins at about c.d. = 6 amp./dm². Data on current distribution at the anode and cathode with varying densities are tabulated and show that, with the lower c.d., the solution of iron proceeds only at the anode. Cf. Von Konrad Georgi (*Zt. f. Elektrochem.*, 1933, 39, 745).

A special feature in electrolytic baths for the production of iron powder, as shown in details tabulated, is the uneven or unfavourable relation between electrode surfaces. Moreover, with high c.d. at the cathode and low c.d. at the anode, electrolysis is accompanied by a fall in acidity of bath.

Attempts to avoid this by introducing an auxiliary platinum anode immersed in sulphuric acid, with insulating diaphragm, and passing a part of the current through this—equivalent to the amount of hydrogen evolved at the cathode—were not successful. It was possible in this way to control the pH of the electrolyte, but it was inconvenient, as more time was required to determine optimum distribution of current and ensure constant acidity of electrolyte. There was also too much time lag between change in acidity and corresponding change in current distribution. Other methods were used to maintain constant pH, such as a flowing electrolyte.

Constancy of Current

The container had a capacity of 3 litres, and had two anodes of 1 dm² working surface, and between them a cathode, of comb shape, designed so that the current was kept constant at 4 amp. Each test was continued for 24 hours, during which about 100 g. of powder was produced at the cathode. Usually this could be easily removed by shaking or knocking the electrode. Only when sugar had been added to the bath was it necessary to apply mechanical periodical cleaning to remove the coating, usually of soft voluminous powdery material.

To obtain highly dispersed deposits, dilute solutions were used as electrolyte, containing (per litre of water) 25 g. $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, of pH 1.8-3.4, using a c.d. of 0.1-2 amp./cm². (It should be noted that c.d. is sometimes given per dm² and sometimes cm².) Several tests were made in which 15 g./lit. sugar was added. Sulphate ions were removed as much as

possible by washing and decanting the powdered mass, which is then left for some days in water, filtered with a Buchner funnel, dried under vacuum of 100 mm. Hg at 50° C.

Drying at different temperatures (30, 50, and 90° C.) and under different pressures (25, 50, 100 mm.) confirmed Balshin's results (*loc. cit.*) that, in these conditions, there is minimum oxidation of iron. Washing with alcohol gave negative results. Detailed results, including content of three forms of iron in powder (Fe^{2+} , Fe^{3+} and Fe^{0}), and fineness, are tabulated: pH was 1.8 and 3.4, and c.d. from 0.1 to 2 amp./cm²; temperature was 25° C.

Voltage Potential

With pH at 3.4 electrolysis proceeded under relatively high potential, and deposits were voluminous, slowly forming, and dark-coloured. Washing out sulphur from these was difficult. After drying they yielded a strongly oxidised product. With pH of 1.8, powders contained more metallic iron, and sulphur could be easily removed. Addition of sugar produced a fairly sharp rise in voltage potential, and deposits had lower content of metallic iron, were of a greenish tint, often voluminous, and some 2 per cent of sulphur, probably as iron sulphate, persisted.

The composition of the powders depended largely on the extent to which electrolysis was accompanied by deposition of hydrates and oxidation of the product at various stages. Deposits from solutions of pH 3.4, and still more so from solutions containing sugar, which interferes with control or adjustment of concentration, are contaminated with considerable amounts of hydrate. With more acid solutions (pH 1.8) the powders show relatively pure metallic iron. Some analyses of freshly prepared cathodic deposits under non-aerobic conditions show that the dry powder consisted of a more or less complex mixture of metallic iron, with hydrates, and with oxides in various stages of oxidation.

The dried powders, laminated, were subjected to electrical testing as described in earlier work (*loc. cit.*). They were obtained from solutions of pH 3.4, and even so did not absorb a charge if the Fe^{2+} content was not fairly high, and if composition of powder did not approximate to that of powders obtained from more acid solutions. Deposits from sugared solutions, as might be expected, were in all cases passive.

Powders obtained from the more acid

solutions were better suited to moulding. After the first charge cycle they showed capacity not less than 0.1 Ah/g. of mass. In succeeding discharge cycles there was invariably noted a rapid loss of capacity. Some test specimens showed complete loss even at the third discharge cycle. It may be supposed in such cases that, at some stage or other, the powders become contaminated with foreign matter to a fairly considerable extent. It is known that, even in two-stage electrolytic refining of iron, it still invariably contains small amounts of foreign matter. With highly dispersed deposits the risk of such contamination is increased. Despite the use of pure iron (Armco) anodes qualitative tests for the presence of manganese in the cathodic deposits were positive. The negative effect of manganese has been already noted (Lyzlov, *Trans. Leningrad Khim. Tekh. Inst.*, 1941, 10, 71).

The addition of cupric or mercuric oxide to improve efficiency of the iron electrode was recommended as long ago as the Eng. patent of Edison, No. 322/1903 (accumulator), and this method is still adopted. The present authors tried the effect of adding 6 per cent mercuric oxide, and with powders produced from acid electrolyte (pH 1.8) the addition markedly stabilised capacity. Some curves are shown by way of example, showing the time/voltage relation for different cycles, with and without addition of mercuric oxide.

In those cases where cathodic precipitation of iron is accompanied by an initial

and rather considerable amount of hydrates, e.g., in electrolysis of dilute solution with high initial pH, or when sugar is added, the authors note that the powders after first charge do not show measurable capacity and could not subsequently be moulded. Under these circumstances the electrochemically active particles become discrete or separated from one another by particles of adsorbed hydrated ferrous oxide readily transforming into ferric hydrate and incapable of reduction or regeneration under ordinary conditions of accumulator working.

With more acid baths and less formation of hydrate the cathodic iron is, of course, more active, even when composition and dispersion resemble those of the above inert powders. In metallic powders trivalent iron appears owing to surface oxidation at first to Fe^0 and then to Fe_2O_3 , which suggests firstly reduction by hydrogen and then partial oxidation.

After further consideration of the electrical tests it is concluded that electrolytic iron may be obtained in an active form if electrolysis is not accompanied by appreciable hydrate deposition and reduction of impurities to a minimum. Addition of mercuric oxide under proper conditions has a good stabilising effect on capacity. Further experiments would be of interest using insoluble anodes. Another interesting line of work would be the use of an alkaline medium, such as that adopted by Kaleids and Rozentsveig (*Collected Works on Research, Chem. Source Elect. Current*, 1935, 1, 84).

ACTIVATED ZINC DUST—IMPROVED MEANS OF PRECIPITATION

THE cyanide process used in gold and silver mining is dependent at one stage upon the treatment of the so-called "pregnant solution," that is to say, the cyanide solution in which the ore has been leached in the presence of oxygen, with finely divided zinc in order to precipitate the gold or silver.

Hitherto zinc dust made by condensation of zinc vapour has been preferred to zinc dust made by atomisation of the molten metal, as it possesses a higher purity and a greater fineness. It is naturally a far more expensive product, but taking its efficiency into account, the gold mining industry has not hesitated to use distilled zinc dust on a very large scale.

An interesting example of technical development in this field can, therefore, be seen in a recent British Patent Specifi-

cation (No. 624,317) granted to the Hudson Bay Co., in which atomised zinc dust is treated with a solution of copper and antimony (copper sulphate and tartar emetic) to give a coated zinc dust that weight for weight is both less expensive and more efficient than distilled zinc dust.

The following figures illustrate the respective efficiencies of the three kinds of zinc dust:

	Ounces of gold and silver precipitated per lb. of zinc dust	
	Gold	Silver
Atomised zinc dust ...	0.0016	0.081
Distilled zinc dust ...	0.0137	0.139
Activated zinc dust ...	0.0160	0.165

While production costs are a quite irrelevant factor in the fixing of gold prices, the mining companies will probably still benefit from such savings due to technical improvements.

METAL HARDNESS TESTS

Russian Criticism of Existing Methods

BECAUSE cutting tools in use are exposed to heat, a study of their qualities, especially hardness, in such condition is important. Existing methods of hardness testing have lately been reviewed in two groups by the Russian workers, A. P. Gulyaev and R. I. Mitelberg.*

The first group comprises the indenter type of test. It is noted first that, in tools employing diamonds, the fixing of the latter in heated metallic holders is difficult owing to the different coefficients of expansion. Methods of measuring hardness in which diamond points are used are accordingly seldom or never employed for tests in the hot state.

The Brinell method is the most commonly adopted in the first group, but the steel ball must now be replaced by one of hard alloy. In the second group an indenter is not used, but the extent of deformation caused by pressing together two test-pieces exactly identical is the criterion.

Cylindrical Test-Pieces

Of the various forms of such test-pieces the cylindrical has been deemed most suitable, disposed either parallel or crosswise. This has been used, for example, by Carter & Grove (*Trans. Amer. Inst. Min. and Metallurg. Eng.*, 1933, 105) who endeavoured to establish a relation between Brinell hardness and "cylindrical" hardness.

In the present work tests were first made with the Brinell hydraulic press and with electric heating for the test-piece and adjacent parts of apparatus. The load applied was 3000 kg./30 sec. and times of heating at a given temperature were 15, 60 and 120 minutes.

With a test-piece of given dimensions and a stated load, the conversion coefficient from cylindrical hardness to Brinell hardness was 1.52.

The following Russian steels were tested, the table including R_c hardness after tempering in oil for 1½-2 min. at 1230-1280°C. (1180° for test-piece No. 6) and annealing.

No.	Mark	C	W	Cr	V	Co	Ti	% Re
1	РК10	0.86	18.1	4.2	1.5	9.4	—	66
2	РФ1	0.60	18.4	3.9	1.2	—	—	65
3	Е1262	0.90	9.4	4.3	2.5	—	—	65
4	Е1381	0.80	4.3	6.6	3.3	—	—	63
5	Е1382	0.83	4.6	4.8	2.4	—	0.1	62
6	Е1184	0.93	4.9	7.3	1.4	—	—	64

These were hardness tested at temperatures of 300, 400, 500, 600, 650 and 700°C. The results graphed and tabulated show Brinell units and width of impress at these temperatures after 15, 60, and 120 minutes' exposure (in averages of four tests).

Steel No. 1 showed little change up to 500°, after which its hardness fell from 700 H_B to 260 at 700°C. Steels Nos. 2, 3, and 4 began to soften at about 400°C. and at 700°C. were much softer than No. 1, while steels 5 and 6 softened still earlier and finally to a greater extent. It is generally concluded that, so far as red hardness in these steels is considered, it is sufficient to test them cold.

No Universal Method

The fundamental method of determining and calculating hardness is the subject of a study by V. K. Grigorovich. The three well known methods of hardness testing, namely: Brinell, Rockwell, and Vickers, and their relevant formulae, do not wholly fulfil all the conditions, at least from the point of view of universal application and standardisation.

The author describes the essential requirements thus: (1) The method must be capable of use with both plastic and brittle materials, whether of micro- or macro-dimensions; (2) the hardness determined should be reliable as a characteristic constant independent within wide limits of the load applied; (3) relevant calculations should be simple and reliable, so that hardness has a definite physical significance. (4) The apparatus and use must be simple and reliable.

There are good reasons why existing instruments should be capable of adaptation to these desiderata. The Brinell machine, for example, is not capable of universal application, since the steel indenter naturally cannot be used for very hard materials or alloys. If the steel ball is replaced by a diamond, as in the Shore monotrone, the conversion is expensive and inconvenient; tests under various loads would need a large number of diamond indentors.

The second condition also is difficult to fulfil. Independence of hardness number of magnitude of load is attainable only by maintaining mechanical similarity, which means similarity of geometrical form of impress. But this form often differs

* *Zavodskaya Lab.* (Vol. 15, 1949, pp.447-453, 457-460)

under varying load for the same hardness of test-piece. Thus the Brinell hardness number and formula relating load to diameter squared (P/d) is not strictly valid under different loads: with increasing loads this ratio increases. For this and other reasons the Brinell method is considered unsatisfactory.

On similar grounds, the Rockwell instrument (loads 150, 100, and 60 kg.) and the Superficial Rockwell (loads 45, 30, and 15 kg.) are not suitable for a wide variety of materials, including micro work, and also fail in respect to the second condition. For each load combination and type of indenter there are special hardness numbers not comparable with other scales.

Experiments are stated to have shown that the use of a diamond pyramid, especially in connection with micro-hardness work, approaches more nearly to what is required. In any case, it conforms more closely with the second stipulated condition, since the impress has the same form, irrespective of load, in the case of uniform hardness and yields a constant characteristic. It is well known that in micro-hardness tests the value sometimes increases, due to tempering, or other irregularities.

Reference is made to earlier work of Smit and Sendlend (*Jal. Iron and Steel Inst.*, 1925, 1, 285-304) who endeavoured to correlate results by this method with those of the Brinell method. On the basis of their proposals, the author suggests that calculation should be based on the assumption that the hardness number given by the pyramid indenter is independent of load, and that at all depths of indentation the relation of area to lateral dimensions is constant.

A formula is given for pyramid area and for average pressure (force) exerted per unit area of impress, which in turn may be related to projection area of impress, so that finally hardness may be calculated thus:—

$$H_{ap} = \frac{P}{S_{ap}} = \frac{2P}{d^2}$$

This is somewhat simpler than existing formulae and seems to fulfil the requirements of a definite physical constant. Changing over to this formula does not present any difficulties, since between both hardness figures there is the constant relation $H_{ap} = 1.078 H_v$, owing to the simple geometry of the pyramid indenter. Change in method of calculation does not involve any change in construction or basic principles of existing apparatus.

METAL WORKERS' SAFEGUARDS

New Devices in the U.S.S.R.

REPORTS from the U.S.S.R. state that the Labour Safety Museum of the All-Union Central Council of Trade Unions has been reconstructed and considerably supplemented by exhibits showing the latest achievements in safety equipment. Interesting additions are protective devices for planing and turning lathes for high-speed metal cutting. These safeguards are based on the photo-electric principle and ensure that, should a worker put his hand into the machine, the mechanism will stop instantly.

A special section is devoted to the protection of workers in metal foundries. Models demonstrate the latest method of disposing of furnace fumes, developed by the Kharkov Labour Protection Institute. A special ring is inserted in the cupola furnace which selectively prevents the fumes from emerging and directs them to a secondary burning chamber where they are rendered harmless. This method also serves to pre-heat the air blast of the furnace. An effective means of improving conditions of workers in heating and forging sections of mills is a device which creates a water curtain in front of the furnace.

This year, many new safety technique laboratories have been established at new Soviet Russian works. The safety technique laboratory is the centre of industrial welfare propaganda on a large scale. Each new worker is here shown the safety technique devices for his works.

Rumanian-Russian Monopolies

RUMANIA and the U.S.S.R. have recently signed agreements providing for the establishment of three new Rumanian companies in which 50 per cent of the capital will be owned by the Soviet Union. These companies will control coal mining, metal production and building material manufacture. At the same time, agreements were signed for the extension of the activities of the six mixed companies already in existence. Thus, there are now nine such companies controlling the most important sectors of Rumania's economy: Sovrompetrol (oil), Sovromlemn (timber and timber products), Sovromtransport (transport), Sovromtraktor (agricultural machinery), Sovromchim (chemicals, mainly fertilisers), Sovromgas (exploitation of natural gas resources) and the new companies mentioned—Sovromcarbune, Sovrommetal and Sovromconstructii.

METAL RESOURCES OF JUGOSLAVIA

Scope for Wide Development of Home Materials

OF vital importance to the economy of Eastern Europe are the mineral resources of Yugoslavia, which seem likely to become a consideration of major importance in the "cold war" between the Soviet "bloc" and the Western nations.

The potentialities of Yugoslavia's large mineral resources which have until lately been little developed, were recently described in an article in *The South African Mining and Engineering Journal* (60, 1), from which the following facts are abstracted.

Iron ore of good quality occurs in large quantities near the surface at Ljubija, in Bosnia, where it is mined by the State authorities and sold for export. Another iron mine is worked by the State at Vares in Bosnia, in conjunction with a coal mine, an iron-smelting establishment, and the iron works at Zenica.

Before the war metallurgical activities were on a comparatively primitive scale, production being confined to pig-iron and small castings.

There are also iron works at Jesenice in Slovenia, which had a pre-war capacity of 70,000 tons per annum and produced bar iron, iron and steel sheets, steel rails up to 22 kg. per metre (as used in the Bosnian narrow-gauge railways), rolled iron, drawn iron and iron rails.

Bar iron is manufactured at Store in Slovenia, steel and steel springs at Gustanj on the Maribor-Klagenfurt railway, and highly silicated foundry iron is produced at Sopusico in Slovenia.

In September, 1939, a new blast furnace rated at 25,000 tons a year was lighted at Caprak, and a second furnace was planned in the same year.

Pig Iron

Total production of pig-iron during 1939 was estimated at approximately 70,000 tons, while the output of iron ore was in the vicinity of 600,000 tons annually.

Yugoslavia is the largest producer in Europe of antimony ore. There are deposits at Sejaca, near Loznica, at Krupanj, and near Ivanjica, to the south of Central Serbia. The Krupanj deposits used to be mined and smelted by a British company, Podrinje Mines, Ltd.

The metal content of the ore produced in Yugoslavia in 1939 was 4220 tons, and production for 1940, the last year for

which statistics are available, was estimated at 4860 tons.

Copper is produced at Bur and Majdanpek in Serbia. For several years before the war the output was increased sharply, a record production of 63,000 metric tons having been reported for 1939.

Chromite

Production of crude chromite in 1939 was 44,097 tons, the leading producer being a British firm, the Allatini Mines, Ltd., which operated several properties, including the Orasie mine and a washing plant at Radusa with a daily capacity of 100 tons of ore.

Small deposits, grading 25 to 30 per cent Cr_2O_3 , in serpentinised peridotite bodies predominate. The iron content ranges from 12 to 16 per cent and in the concentrates SiO_2 ranges from 4 to 6 per cent.

Lead mining and smelting is a Jugoslavian industry which has been assuming increasing importance in recent years. In 1939 mine production amounted to 775,000 metric tons of ore containing 69,000 metric tons of lead.

New exploration work was in progress at the Stantrg mine, while another important producer was the Mezica mines, formerly operated by a British company, Central European Mines, Ltd.

A blast furnace and three orehearth having a combined annual capacity of 17,000 tons of metal are operated at Zerjav, where about a thousand men are employed.

Trepca Mines—formerly British owned—used to be the only important zinc producer in Yugoslavia, owning the Koponik, Zletovo and Novo Brdo properties as well as the Stantrg mine.

At the Mezica lead mines in the Karawanken Alps of Northern Yugoslavia, the run-of-mine ore averages about 13.5 per cent lead and 5 per cent zinc, and the zinc content appears to be increasing in depth.

Preparations for building an electrolytic zinc plant at Sabac by a subsidiary company of Trepca Mines were well advanced at the outbreak of war.

Among the minerals exported from Yugoslavia is bauxite from Dalmatia and Herzegovina. Before the war production was in the vicinity of 350,000 metric tons

(continued overleaf)

Non-Ferrous Metal Statistics

Heavy Stocks of Copper, Zinc and Tin in July

THE record production, consumption and stocks of non-ferrous metals in the United Kingdom in July, supplied by the British Bureau of Non-Ferrous Metal Statistics (an abstract from which is published below) again reveals a fairly general increase in stocks. Closing stocks of blister copper were 12,836 tons more than at the end of June; those of refined copper increased by 2223 tons; unwrought zinc in concentrates by 9515 tons; slab zinc (all grades) by 6329 tons; tin metal by 623 tons.

Imported virgin lead stocks were 3591 tons less than at the end of June, and English refined lead decreased by 1378 tons.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers*	38,787	88,238
Imports	22,150	17,900
PRODUCTION:		
Primary	7,500	
Secondary	2,805*	5,002
CONSUMPTION:		
Primary	7,578	22,667
Secondary		11,962
Exports	3,160†	48
CLOSING STOCKS:		
Govt. and consumers*	51,623	90,461

* Rough copper.
† Includes 1200 tons rough copper dispatched to Belgium and 1960 tons rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

	Long Tons
Unalloyed copper products	21,685 long tons
Alloyed copper products	18,217 "
Copper sulphate	3,228 "

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross)	Slab Zinc (all grades) (Zinc content)
OPENING STOCKS:		
Govt. and consumers*	13,841	75,389

Imports	15,384	13,048
PRODUCTION:		
Virgin and remelted	—	4,733
CONSUMPTION:		
Virgin (incl. debase)	5,869	12,521
Remelted and scrap	—	6,630*
Exports	—	25
CLOSING STOCKS:		
Govt. and consumers*	23,356	81,718

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Lead in Concentrates	Long Tons Imported Virgin Lead	Lead Content of second-ary Scrap and Residues
OPENING STOCKS:			
Other than Govt. and consumers*	51	55,614	4,034
Imports	30	6,158	15
PRODUCTION	171	—	1,617
CONSUMPTION	215	10,751	2,995
Exports	—	10	—
CLOSING STOCKS:			
Other than Govt. and consumers*	37	52,023	2,656

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	16,385
IMPORTS	—
PRODUCTION	2,280
CONSUMPTION	1,399
EXPORTS AND RE-EXPORTS	311

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	298
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	230

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	32.85

METAL RESOURCES OF JUGOSLAVIA

(continued from previous page)

annually, the bulk of the output being purchased by Germany.

During the war the Croatian Aluminium Co. was formed at Agram with a capital of 20 million kroner to erect an alumina plant with an annual capacity of 100,000 tons and a reduction plant with a 50,000-ton annual capacity near Hum, Herzegovina.

The ore is obtained from large deposits in the Karst region of Dalmatia and Herzegovina, where bauxite containing 54 to 60 per cent Al_2O_3 is abundant.

"LION BRAND" METALS AND ALLOYS

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GARSTON, LIVERPOOL, 19

ESTABLISHED 1869

PLANT AND POWER FOR AUSTRALIA

Big Development Programme for New Industries

A LARGE increase in the industrial development in some parts of Australia is foreshadowed by recent authorisations bringing to £500 million the total it is intended to spend on electric power generating facilities. Of the total, some £160.5 million will be earmarked for short-term projects designed to treble the present power-generating capacity by 1954, when the output is expected to be about six million kW.

This is in addition to the Snowy Mountains hydro-electric and irrigation scheme which will have a power output of nearly 2 million kW and will itself cost over £160 million.

All the States are, in addition, increasing the development of their coal resources. A spokesman for the Federal Bureau of Mineral Resources has indicated that revised estimates put black coal reserves at nearly 50 billion tons. This is expected to be further increased as present surveys are completed.

The greatest development will be in Queensland, where there are great deposits of first-grade black coal near Blair Athol and at Callide. These can be mined by open-cast methods. The cost of production with modern equipment, is said to be less than that of coal mined by cheap labour in Manchuria, and may provide Australia with the world's cheapest coal.

Potash Fertiliser Industry

Since the end of the war, a considerable change has come over the industrial scene in the State of Western Australia. A new potash fertiliser industry has recently been established in the Meredin district, about 170 miles east of Perth. This industry, working alunite deposits in the almost dry beds of several old lakes in the area, is now producing potash for agricultural purposes at the rate of 4000 tons a year.

Before the war, Australia imported nearly all her potash fertiliser requirements, amounting to over 11,000 tons a year. In a few years, the Western Australian industry will be able to supply the potash needs of the country. It is estimated that the lake alunite would yield 750,000 tons of potash. A private company set out to work the deposits in 1940, but got into financial difficulties. The

industry has since been financed by the Western Australian Government.

Another industry, quite new to the State, which is meeting with considerable success is the wood-distillation and charcoal iron plant at Wundowie, in the Darling Ranges, 41 miles from Perth. It made history last year when it produced the State's first pig iron. Western Australia has large forest areas, and the main object of the Wundowie plant was to experiment with the means of using the immense amount of waste timber and local ore deposits.

Western Australia possesses immense deposits of high-grade iron ore, much of it contained in three islands in Yampi Sound on the north-west coast. The deposits on Cockatoo Island are being worked by Broken Hill Proprietary, Ltd., which will use the ore at its steel works in New South Wales.

S. African Scientific Conference

A REGIONAL scientific conference is to be held from October 17 to 23, at the University of the Witwatersrand, Johannesburg, under the auspices of the South African Council for Scientific and Industrial Research, at which, it is expected, all the territories in Africa south of the Sahara will be represented. Invitations have been accepted by Great Britain, France, Belgium and Portugal, while representatives from UNESCO, WHO, FAO, and the U.S.A., will attend as observers.

The broad purpose of the conference is to examine and report on the possibilities of facilitating and co-ordinating scientific research on problems of common interest to Governments concerned with the development of African territories. The agenda includes subjects for discussion such as geology, geophysics, meteorology and hydrology, soils and plant life, animal life, health, medical and social research, and industrial technology.

The South African organising and reception committees are under the chairmanship of Mr. P. S. J. du Toit, deputy president of the South African Council for Scientific and Industrial Research.

AMERICAN CHEMICAL NOTEBOOK

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From OUR NEW YORK CORRESPONDENT

INDICATING still another industrial application of radioactive isotopes, engineers of the General Electric Company, Schenectady, New York, have begun to put the principle to work on problems of rust control. The engineers have disclosed that they are using radioactive "tracers" to detect photographically how rust starts, where it begins, and how deep it goes. The engineers have followed this procedure:—

(1) A solution containing radioactive iron is electroplated on the surface of a metal to be studied;

(2) a photographic plate is then placed against the metal surface for several days, while the radioactive coating makes an X-ray exposure on the plate;

(3) as the test metal rusts, radiation decreases and shows up as a light area on the photographic plate. By making a series of these records, such facts as the first incidence of rust in different materials and its rate and manner of spread can be accurately plotted.

* * *

Citing the development as evidence of the company's optimistic view of chemical prospects, the president of the Dow Chemical Company, Midland, Michigan, Mr. L. L. Doan, has announced plans for the construction of a new \$5 million ammonia plant to be erected at Freeport, Texas. The plant will have a capacity of approximately 100 tons per day. Field construction is expected to start about January 1, 1950, and it is expected that the plant will be in operation late next year. The plant will employ hydrogen available from Dow's chlorine plant at Freeport with nitrogen from the air to form anhydrous ammonia.

* * *

A new peacetime record in the production of primary aluminum was established by the American industry in May. The Aluminium Association discloses that the industry produced 113,840,944 lb. of primary metal during May, topping all production figures for any month since August 1944. It was almost 3 million lb. more than was produced in the same month a year ago, and about 9.8 million lb. above the average monthly production during 1948.

A U.S.A. market for ilmenite containing approximately 52 to 54 per cent of titanium dioxide is being sought by the Ceylon Government. The Embassy of Ceylon in Washington reports that a plant is being established for the separation of ilmenite, zircon, and rutile, from an extensive beach sand deposit. It is anticipated that the plant will be in production by the end of 1950 with an annual output of approximately 30,000 tons of separated ilmenite. The Government would like to sell this product on a long-term contract.

* * *

A broad survey of the potential uses of titanium is to be given by O. C. Ralston and F. J. Cservenyak, of the U.S. Bureau of Mines, at a symposium at the American Chemical Society's 116th national meeting, which opens in Atlantic City, New Jersey, on September 18. Dr. Bruce W. Gonser will report the results of his research in titanium alloys at the Batelle Memorial Institute, and three industrial chemists of the Westinghouse Electric Corporation will present their findings on the preparation and properties of certain alloys with a titanium base. Dr. G. H. Spencer-Strong and R. F. Patrick, of the Pemco Corporation, will describe how an important industry has already been built by using a titanium compound in the making of porcelain enamel. D. R. Carmody and R. J. Speer, of the Texas Research Foundation, will discuss the use of titanium compounds in dry cleaning and laundry applications.

* * *

One of the fullest reviews of characteristics of the element sodium since it was first isolated by Sir Humphrey Davy in 1807, has been issued by the National Distillers Chemical Corporation, New York, as a 50-page booklet describing the element, its reactions and industrial uses. The publication contains many pertinent equations and an extensive bibliography listing 304 references to articles and patents. Its table of contents includes such sodium topics as: history, handling and storage, properties, industrial applications, and chemical reactions.

Technical Publications

JOINT consultation—its aims and importance—is the subject of a special number of "Ingot," the magazine of Richard Thomas and Baldwins, Ltd. There is an introductory article by Sir George Schuster and a summing up by Mr. E. H. Lever, chairman of the company. It is pointed out that joint consultation is primarily dependent on mutual confidence and the will to agree. Some clever camera studies emphasise the importance of the human side and clearly show how widely representative joint production consultative and advisory committees must be if it is to be effective.

* * *

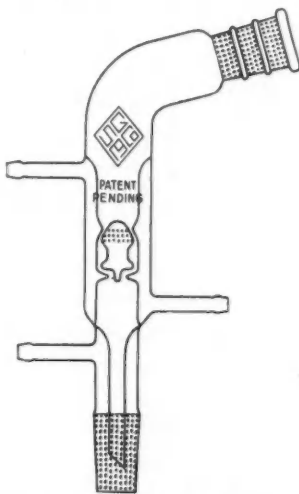
THE use of teak and oak for laboratory fittings is recommended in a leaflet recently issued by A. Gallenkamp & Co., Ltd., describing some of the company's recent additions to its range of standard units. Easy installation, flexibility, silence in use, and comparative resistance to corrosive fumes are among the advantages claimed for this unit method in wood, which permits rapid rearrangement both of the bench layout and of the service fittings.

* * *

"**NUCLEONICS**" is the title of a new monthly publication dealing with nuclear technology introduced by the McGraw-Hill Publishing Co., London. Among the correspondents are: G. Hevesey, Nobel prize winner in chemistry, member of the Institute for Theoretical Physics, Copenhagen; P. Scherrer, Swiss Atomic Energy Commission; E. Bretscher, Atomic Energy Research Establishment, Harwell, England; L. Yaffe, Atomic Energy Project, Chalk River, Canada; C. L. Bakker, director, Institute for Nuclear Physics Research, Amsterdam; and Hans Kopfermann, University of Goettingen, Germany.

* * *

THE Zinc Development Association, Lincoln House, Turl Street, Oxford, and its affiliated associations deal in the latest *Zinc Bulletin* with zinc alloy castings in the motor industry, which consumes a greater quantity of zinc each year than any other industry, and has held this lead for many years now. A reflection of this is the fact that a single modern motor car may contain some 150 zinc castings for mechanical, coachwork and electrical fittings, as shown in a diagram in the



*Modern American scientific glassware—
the new Theimer glass vacuum adapter
for fractional distillation*

bulletin. Another article describes the process of Sherardising and its uses and how zinc in such applications can defeat the combined attack of corrosion and periodic stresses on steel and aluminium.

* * *

THE addition to water of wetting agents to improve its effectiveness for fire fighting purposes is the subject of experiments described in an article by members of the Joint Fire Research Organisation of the Fire Offices' Committee and the Department of Scientific and Industrial Research in the current issue of the *FPA Journal* (No. 6, July). It was found that wetting agents were valuable for controlling heath fires, by employing them in the saturation of unburnt materials ahead of the fire, the reduction of surface tension greatly facilitating the wetting operation.

* * *

THE work of the DSIR, its origin and the scope of its many research establishments, are described in a well produced booklet, "DSIR" (H.M. Stationery Office, 1s.) just issued.

• PERSONAL •

THE Pharmaceutical Society announces the award of two Fellowships of the value of £300 a year for two years. The Ransom Fellowship has been won by Mr. R. A. WEBB, B.Pharm. (London), B.Sc. (London), 4 Higham Road, Woodford Green, who will do research work in organic chemistry at the University of London School of Pharmacy. Mr. B. K. MARTIN, B.Pharm. (London), 65 Peveril Road, Beeston, Nottingham, who wins the society's own scholarship, undertakes at Nottingham University an investigation of the synthesis of pteridines and other related heterocyclic compounds.

The award of two Merck postdoctoral fellowships in the natural sciences for the year 1949-50 is announced by the Canadian National Research Council, at Ottawa. Grants have been made to Dr. D. A. I. GORING, of McGill University's department of physical chemistry, who will study colloid science under Prof. F. J. W. Roughton, F.R.S., at Cambridge University, and to Dr. M. J. MILLER, of the Institute of Parasitology at Macdonald College, who will pursue his studies in medical parasitology and clinical tropical medicine under the direction of the School of Tropical Medicine at the University of Calcutta, India. The purpose of the Merck Fellowships is to give special training and experience to young men and women who have demonstrated marked ability in research in chemical or biological science and who wish to broaden their fields of activity.

PROF. THEODORE SVEDBERG, Swedish Nobel laureate and veteran of physico-chemical research, who will shortly relinquish his lectureship, to become emeritus professor of Uppsala University recently delivered a valedictory address before the Society of Chemistry of Uppsala.

COLONEL G. G. H. BOLTON, marketing director of the North-Western Divisional Board, National Coal Board, has been appointed deputy chairman. He succeeds Mr. W. J. DRUMMOND, who was appointed chairman of the Divisional Board in June.

DR. JACK M. ROWSON, head of the pharmacy department of Sunderland Technical College, has taken up the appointment as curator of the museum of the Pharmaceutical Society of Great Britain.

DR. H. N. RYDON has been appointed

reader in organic chemistry in the Imperial College of Science and Technology.

The American Chemical Society announces the following awards:—DR. AGNES FAY MORGAN, a pioneer in the chemical study of nutrition and dietetics, and since 1938 head of the University of California's department of home economics, is to receive the 1949 Francis P. Garvin medal honouring women in chemistry. DR. HENRY A. LARDY, associate professor of biochemistry in the University of Wisconsin, will receive the bronze medal and \$1000 Paul-Lewis Laboratories award in enzyme chemistry. DR. GEORGE R. GREENBANK, of the U.S. Department of Agriculture, receives the gold medal and \$1000 Borden award in the chemistry of milk.

MR. A. A. POLLOCK has retired from the post of director and chief mechanical engineer of The British Thomson-Houston Co., but will remain available in a consultative capacity. He has been associated with a number of developments in design and technique. Mr. K. R. HOPKIRK has been appointed to succeed Mr. Pollock as chief mechanical engineer.

MR. HERBERT STANLEY DIGGORY, of Rye-croft, Ruabon, managing director of Diggory & Co., Ltd., chemical manufacturers, of Liverpool, and a director of Graeffe's Salicylates, Ltd., Hawarden, who died intestate, left £30,181 (net £27,732).

To Survey Greenland Lead

A PARTY comprising 32 Swedish geologists, prospectors, miners and air-men is to accompany an expedition organised by the Danish Government to East Greenland, where the Danish explorer, Dr. Lauge Koch, last year made remarkable discoveries of lead-ore and other minerals in King Oscar Fjord. At the edge of the inland ice, large quantities of 84 per cent lead-ore were found as surface deposits and it is believed that at this site alone, some 1 million tons of lead could be mined. The Swedish experts will check Dr. Lauge's observations, which suggest this is one of the world's largest lead-ore lodes. The party will be led by a member of the Swedish State Geological Survey and will include staff of the Swedish Boliden concern and 11 Swiss and six British members.

HOME

Kaolin Exports Halved

Devon and Cornwall china clay exports in July totalled only 16,499 tons, little more than half the quantities exported in the corresponding months of 1948 and 1947.

Textile Technology

A refresher course in textile technology arranged in conjunction with the Midlands Section of the Textile Institute and of the Society of Dyers and Colourists is to be held in November at the Leicester College of Technology and Commerce.

Diatomite Production in Skye

Good progress is being made in the development of the diatomite workings in Skye, helped by favourable weather. Roads are being developed and a limited amount of production and disposal is in progress, pending the development of the fully mechanised scheme of production.

Gas Prices Raised

An increase in gas prices representing an average addition of 1.64d. per therm has been announced by the North-East Region Gas Board. The higher prices are to cover the deficiency, estimated to be £575,000, incurred since the board assumed control just under a year ago.

Substituted Thioureas

British Chemicals & Biologicals, Ltd., announces that the following substituted thioureas are now in commercial production: ethylene, α -naphthyl, phenyl, *o*-tolyl, *di-o*-tolyl. Other thioureas which are available in research quantities are: *n*-amyl, *ethyl*, *n*-hexyl, β -naphthyl, *n*-propyl, *m*-tolyl, *p*-tolyl.

New Control of I.T.D., Ltd.

The Austin Motor Co., Ltd., and Crompton Parkinson, Ltd., announce that, through their joint subsidiary company, Austin Crompton Parkinson Electric Vehicles, Ltd., they have acquired control of I.D.T., Ltd., of Stacatruc House, 142 Sloane Street, London, S.W.1. I.D.T. is the sole distributor of the petrol-driven range of British industrial fork lift trucks and ancillary materials-handling equipment marketed under the trade names Stacatruc and Aerolift. Mr. L. P. Lord, chairman and managing director of the Austin Motor Company, has been elected chairman, and Col. Raymond T. Hartmann will continue as managing director of I.D.T., Ltd.

Plastic Floor Tiles

Flexible and resilient tiles, which will not support combustion, and have virtually no water-absorption are now being manufactured by De La Rue Floors and Furnishings, Ltd., at its Tynemouth factory. The tiles, in a variety of colours, are said to be impervious to most acids, oils, alkalis and alcohol.

Export Progress

Industrial achievement towards the export targets for the end of 1949 was shown in figures published by the *Board of Trade Journal* (157, 384). July rates with targets (in brackets) were: Chemicals, dyes and dyestuffs, paints, pigments, varnishes, etc. (£ million): 5.27 (7.25); drugs and medicines 1.16 (1.75); oils, fats, and resins 1.21 (1.35).

Coal Output

Last week's total output of coal in Britain was 238,600 tons less than in the previous week, due, apparently, to the strike of pit cage winders. Comparative figures are:—Last week: 3,771,400 tons (deep-mined 3,509,700 tons, opencast 261,700 tons). Previous week: 4,010,000 tons (deep-mined 3,748,300 tons, opencast 261,700 tons).

Galvanised Tank Prices Reduced

As a result of the reduction in the cost of raw materials a decrease equivalent to $2\frac{1}{2}$ per cent of the basic prices of galvanised tanks and cisterns manufactured by members of the Associated Tank Manufacturers has been announced by the Minister of Works. The new rate affects all deliveries made on and after Monday, August 15, 1949.

Solvents Prices Reduced

Reduction of the prices of several solvents was announced by Shell Chemicals, Ltd., last week. Prices, per ton, for amounts less than 1 ton up to 100 tons and over, in 40/45 gallon drums, range between the following (the previous price being shown in parenthesis): Methyl ethyl ketone, £99 10s. to £95 10s. (£103 to £100); methyl isobutyl ketone, £136 to £132 (£143 to £140); secondary butyl alcohol, £107 to £103 (£123 to £120); isopropyl ether, £99 to £95. Delivery is free, and bulk deliveries in tank wagons are subject to rebate (minimum 400 gal.).

OVERSEAS

Ceramic Research in U.S.A.

Investigations into the source of gases causing blisters, bubbles in glazes and similar defects in fired ware, will form part of the research programme established by the Edward Orton, Jr., Ceramic Foundation, at Ohio State University, Columbus, U.S.A.

Welsbach Honoured

A statue of Karl Auer von Welsbach has been erected at Treibach, Carinthia, the place of his famous achievements. Dr. Hopfner, Rector of the Technical High School, Vienna, in a memorial speech, recalled the important changes in science and industry which had followed his innovations—the Auer light, the osmium lamp, the cerium iron, the metal-fibre lamps, etc.

Subsidies for Chilean Copper

The Chilean Minister of Finance, Sr. Alessandri, has submitted to Congress a project for the payment of subsidies to smaller copper producers, involving an annual outlay of some 30 million pesos. This measure is to enable small-scale units to maintain operations while copper prices decline on the U.S. market. Subsidies are to be granted as soon as the official U.S. copper price falls below 20 cents per lb.

Brazilian Fertiliser Company

The Cia Brasileira de Adubos has been formed in Sao Paulo to manufacture superphosphates, states the U.S. *Exporters' Digest*. The company, combining French and Brazilian interests, is expected to begin production in the course of a few months. M. J. L. Le Corne, president of the Comptoir des Phosphates de l'Afrique du Nord, is one of the founders. Raw phosphates will be brought from North Africa.

Swiss Chemical Exports

July exports from Switzerland of chemicals, pharmaceuticals, dyestuffs and perfumery reached a total value of Fr.42 million, against Fr.41.1 million in June. Industrial chemicals fell from Fr. 5.8 million to Fr. 4.9 million, and shipments of pharmaceutical products declined from Fr. 16.3 million to Fr. 14.7 million. These decreases were, however, more than offset by the marked rise in dyestuff exports, from Fr. 16.6 million to Fr. 20.3 million. There was also a small increase in the value of perfumery exports from Fr. 1.9 million to Fr. 2.1 million.

Textile Chemicals Plant

According to the *Exporters' Digest*, a U.S. monthly, E. F. Drew & Co., Ltd., of New York, is reported to be planning a Sao Paulo plant to make textile chemicals. The company now imports raw materials from Brazil, processes and re-exports them.

Plastic "Lung"

The Swedish epidemics hospital is trying out a substitute for the iron lung which is made of plastic material. It is hoped that this will allow sufferers from infantile paralysis to occupy ordinary hospital beds instead of the tent-like fixtures at present in use.

Ample Production of Tannery Materials

Italy's production of tanning materials is reported to have reached the pre-war figure of 36,000 to 38,000 metric tons annually. Domestic requirements are being met in full and a lively export business has been developed. The U.K., Switzerland, Czechoslovakia and Germany are the chief markets.

Chilean Oil Expansion

The Chilean Corporacion de Fomento de la Produccion is reported to be spending \$2 million to expand production of its commercial oilfield at Cerro Manantiales (Spring Hill), Terra del Fuego. A terminal storage capacity of 215,000 barrels is proposed and the whole may be in operation by the end of this year.

Belgian Labour Agreement

A commission on the chemical industry has ratified a collective bargaining agreement on justifiable absences from work. These, the agreement states, should be paid at the usual rates (and here a list of justifiable reasons are given), but in order not to hold up important and urgent work, the worker should be prepared to work overtime, for which he will be paid at overtime rates.

U.S. Plastics Exhibition

The 1950 U.S. National Plastics Exposition, a four-day event in which every major part of the American plastics industry participates, will take place during March 28-31 at the Navy Pier, Chicago, Illinois. An official of the Society of the Plastics Industry has announced: "Our next industry show is shaping as a place for producers and processors to come together with end-users to merchandise ideas as well as products."

THE PUBLISHER'S PROBLEM

High Costs and Little Paper

"INDUSTRY is still, unhappily, deprived to a considerable extent of the information and the services of the Trade Press on the scale to which it was accustomed before the war, and which publishers are ready and eager to restore if the Government will get out of the commodity markets and enable business to flow along normal channels," said Mr. E. Glanvill Benn, chairman, at the recent 53rd annual general meeting of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE and associated journals. "There is no world shortage of wood pulp, yet in this country supplies of the raw material for the paper industry are still most severely restricted."

The chairman said that sales of the company's journals overseas had again expanded, while larger sales at home had been made possible by the slightly larger allocations of paper during the year; but it was still the case with the Benn publications that demands were very far from being met. It was quite impossible to assess the damage and loss resulting from restrictions on the dissemination of information and knowledge vital to industrialists and traders through the prolongation of the Paper Control and its regulations.

The fact that revenue from advertisements and sales alike touched a new high record in the 69 years' history of the company was a matter for satisfaction; what was equally pleasing was the fact that every branch of the business, without a single exception, had contributed to that achievement.

Price of Paper

During the year, some saving was effected through a small reduction in the average price of paper, but this was heavily offset by the increase in the cost of printing. If printing costs had remained at the same level as in the previous year, the profit of Benn Brothers, Ltd., in 1948/49 would, before tax, have been some £23,000 greater. Expressed in another way, the decrease in profit for the year of £16,000, as shown in the profit and loss account, would have been converted into an increase of £7,000.

Taxation absorbed about one-half of the net profit of the company to-day, compared with about one-quarter 10 years ago and one-sixth 20 years ago. Again, averaged over the past two years, taxation had

(continued at foot of next column)

NEXT WEEK'S EVENTS

MONDAY, SEPTEMBER 5

Welsh Industries Fair

Cardiff: Drill Hall, Dumfries Place. Daily 12 noon to 8 p.m. (until September 10). Welsh products, including chemicals, electric equipment, paints and varnishes, plastic flooring and walling, etc.

TUESDAY, SEPTEMBER 6

Royal Netherlands Industries Fair

Utrecht: Daily until September 15.

Incorporated Plant Engineers

Cardiff: Grand Hotel, 7.30 p.m. Lecture: "Lubrication," by a technical representative of the Vacuum Oil Co. Film: "The Inside Story."

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, 6.30 p.m. Opening of Midlands Centre session. R. C. Davies (new chairman) will read a paper on the history of electrodeposition.

THURSDAY, SEPTEMBER 8

Incorporated Plant Engineers

Newcastle-on-Tyne: Turk's Head Hotel, 7.15 p.m. L. Walmsley: "Materials Handling Equipment."

FRIDAY, SEPTEMBER 9

Aslib

Leamington Spa: Ashorne Hill, 24th annual conference of the Association of special Libraries and Information Bureaux (including the British Society for International Bibliography), until September 12. The conference will be opened by Dr. Percy Dunsheath, president-elect.

SATURDAY, SEPTEMBER 10

Flanders International Fair

Ghent: Daily, until September 25.

International Levant Fair

Bari: Daily, until September 26.

taken each year about two shillings in every £1 gross income, before charging any expenses whatsoever.

In spite of this heavy drain of taxation, over £100,000, excluding the annual sums written off the item "Goodwill and Copyrights," had been added in the last three years to the company's reserves, including the increased amount carried forward.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

H. & G. PLACE & CO., LTD., Sale (Ches.). Chemical manufacturers, etc. (M., 3/9/1949.) July 27, debentures, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£3000. July 2, 1948.

Mortgage Satisfaction

LAFARGE ALUMINOUS CEMENT CO., LTD., London, W. (M.S., 3/9/49.) Satisfaction July 27, of debenture stock registered June 25, 1946, to the extent of £5555.

MARCHON PRODUCTS, LTD., London, N.W., chemical merchants, etc. (M.S., 3/9/49.) Satisfaction July 28, of three mortgages registered January 13, 1947.

SOUTHERN CHEMICALS, LTD., Dublin. (M.S., 3/9/49.) Satisfaction July 27, of debentures registered September 19, 1939.

Company News

Dufay-Chromex, Ltd.

Substantial trading losses, £101,223 during the year ended September 30, 1948, and some £50,000 in six months to March 31, 1949, are attributed to difficult export trading conditions and the contraction of purchasing power in this country. Some of the factories are to be closed and their work transferred to the central works at Elstree.

Fisons, Ltd.

Proposals have been disclosed to increase the issued capital by over £5 million to £10.5 million by the issue to shareholders of over £2 million ordinary shares

and later £3 million unsecured stock. Current net profits, after tax, are expected to reach £405,000.

Metal Industries, Ltd.

Profit for the year to March 31, before deduction of tax, is £891,542 (£718,173). Ordinary dividend remains 7 per cent.

Increases of Capital

The following increases in capital have been announced: **CHIPMAN CHEMICAL CO., LTD.,** from £20,000 to £50,000. **HAPPE PRODUCTS, LTD.,** from £10,000 to £15,000. **LAPORTE CHEMICALS, LTD.,** from £1,000,000 to £2,000,000. **INTERNATIONAL PAINTS, LTD.,** from £750,000 to £1,300,000.

New Registrations

Gordon Haywood, Ltd.

Private company. (472,101). Capital £2000. Manufacturers of artificial manures and fertilisers. Solicitors: Wells and Hind, Nottingham.

J. & J. Makin (Metals), Ltd.

Private company. (472,142). Capital £100,000. Objects: To carry out all operations in relation to the manufacture in powdered form of metals and alloys and to the heat and other treatment of metals and alloys, to carry out research and experimental work, etc. Directors: J. R. Makin Pilling and J. Makin Kay. Reg. office: Grosvenor Chambers, 16 Deansgate, Manchester.

Xzit (G.B.), Ltd.

Private company. (472,058). Capital £4000. Objects: To carry on the business of manufacturers, producers of liquid oil treatments consisting of coal tar and mineral solvents combined with metallic soaps, refractory coatings consisting of clays and metal oxides combined in oil to produce heat resisting coatings. Directors: Commander A. L. White, R.N. (retd.), and E. Sworder. Solicitors: Hunters, 9 New Square, Lincoln's Inn, W.C.2.

Licences for Cold Pressure Welding

Arrangements have been made for the issue of non-exclusive user licences to all firms wishing to use the cold pressure welding process (except for certain electrical uses) developed by the General Electric Co., Ltd., at a low royalty rate.

The Stock and Chemical Markets

BUSINESS in stock markets continued to contract as great caution prevailed in anticipation of the Washington talks on Britain's dollar problems. At the time of writing, the view that devaluation of the £ is probable appears to be gaining ground, and as a result British Funds have lost part of their recent rally.

There has, however, been firmness in industrial shares, particularly those of companies whose export business would be stimulated and whose dollar assets in the U.S.A. and Canada would be increased in terms of sterling if the £ sterling were reduced in value in relation to the dollar.

Chemical and kindred shares have been firmer generally, although best levels were not entirely maintained. Imperial Chemical at 43s. 4½d., for instance, have not retained an earlier rally, but Monsanto showed steadiness at 49s. 4½d. Fisons have been more active around 40s. 6d., Albright & Wilson were 27s. 9d., and Brotherton 10s. shares 19s. 9d.

Elsewhere, Amber Chemical 2s. shares were 4s. 3d., and Bowmans Chemicals 6s. 6d. William Blythe shares changed hands around 20s. 6d., and Boake Roberts were 29s. 9d., while Laporte Chemicals stayed at 21s. on the share bonus. The 4s. units of the Distillers Co. have risen to 27s. 1½d. on further consideration of the strength of the balance-sheet and the share bonus.

Triplex Glass (18s.) have been steadier, awaiting the full results and the chairman's annual statement, while United Molasses (38s. 6d.) have been favoured, being among shares of companies which are important dollar earners, as have Turner & Newall at 77s. 6d. British Aluminium were steady at 43s. 3d., and Borax Consolidated have advanced to 54s. 4½d. being again in demand because of the company's important interests in the U.S.

Amalgamated Metal at 18s. failed to hold an earlier gain, although the assumption in the City is that if sterling were devalued, re-opening of the London Metal Exchange would quickly follow. Metal Traders shares have risen further to 47s. 6d. in anticipation of the financial results. British Glues 4s. shares kept firm at 19s. following publication of the report and accounts, while in other directions, General Refractories strengthened to 22s. 9d. German Potash Bonds were inclined to ease after the latest official state-

ment on the negotiations on the question of resuming interest payments.

Iron and steels have been firmer, although movements were again small.

Boots Drug at 49s. 6d. were higher, as were Timothy Whites at 32s. 6d., and Beechams deferred further improved to 13s. 3d. Sangers were 28s., and Griffiths Hughes 18s. British Xylonite firmed up to 71s. 3d., De La Rue have been active round 26s. 3d., British Industrial Plastics 2s. shares were again 4s. 10½d., and Klee-man became steadier at 11s. 1½d. Elsewhere, however, Glaxo eased to 18½.

Market Reports

THERE have been no changes of importance on the London chemicals market during the past week. A fair amount of new business has been reported although, due to the easier supply position, consumers, on the whole, tend to cover no more than their nearby requirements. A fairly satisfactory export demand for chemicals has been maintained and values generally show little alteration from recent levels. Quiet conditions continue to prevail on the coal tar products market.

MANCHESTER.—Reasonably active trading conditions have been reported during the past week on the Manchester chemical market. There has been a steady call for textile bleaching, dyeing and finishing chemicals and contract deliveries of these, as well as of most other industrial chemicals, have been well maintained. Fresh inquiries on both home consumption and export accounts have been fairly numerous and have covered a wide range of products. Prices generally have been well held. In superphosphates and certain other sections of the fertiliser market further buying well in advance of actual requirements has been reported. With regard to the by-products, comparatively quiet conditions have been reported again in most sections.

GLASGOW.—Scottish chemical market conditions have been a little more active during the past week, and many prices have continued to show slight decrease as competition becomes much keener. The volume of business being transacted is about average for the time of year, the only noteworthy shortage being carbon tetrachloride, where the position is becoming a little difficult.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Methods of preparing organogermanium halides.—British Thomson-Houston Co., Ltd. April 16, 1946. 626,398.

Trimethyl halogenophenylsilanes.—British Thomson-Houston Co., Ltd. June 14, 1946. 626,515.

Process for preparing halogen-substituted unsaturated organic nitriles.—N.V. De Bataafsche Petroleum Maatschappij. June 28, 1946. 626,516.

Preparation of organohalogenosilanes.—British Thomson-Houston Co., Ltd. June 28, 1946. 626,519.

Manufacture of intermediates in the synthesis of adrenal cortical hormone.—Merck & Co., Inc. July 14, 1945. 626,523.

Production of vinyl naphthalene.—Koppers Co., Inc. July 13, 1945. 626,362.

Production of methyl naphthyl carbinol.—Koppers Co., Inc. July 13, 1945. 626,363.

Controlling the composition of steel alloys during the manufacture thereof.—A. H. Stevens. (E. D. Bransome.), Dec. 30, 1942. 626,604.

Methods of finishing textile materials, and textile materials, fabrics or yarns resulting therefrom.—Monsanto Chemical Co. July 26, 1944. 626,847.

Surface treatment of aluminium and aluminium base alloys.—H. R. Watson, and A. T. Ward. Oct. 23, 1945. 626,693.

Production of powder or sponge of metals or metal alloys by electrolytic reduction of metal oxides or other reducible metal compounds.—E. H. E. Johansson. Jan. 5, 1945. 626,636.

Colloid materials.—E. I. Du Pont de Nemours & Co. April 26, 1945. 626,954.

Device for granulating molten chemicals.—Spolek Pro Chemickou A. Hutni Vyrobu, Narodni Podnik. Sept. 24, 1941. 626,948.

Preparation of benzene hexachloride.—Solvay & Cie. March 28, 1946. 626,705.

Method for producing alkali metal oxides and peroxides.—Mine Safety Appliances Co. Dec. 14, 1940. 626,644.

Methods of preparing an artificial resin and the artificial resin resulting therefrom.—Quaker Oats Co. April 4, 1945. 626,645.

Manufacture of fritted hard alloys.—Regie Nationale des Usines Renault. May 16, 1940. 626,653.

Apparatus for use in carrying out chemical reactions.—Anglo-Iranian Oil Co., Ltd., and R. O. Judd. Aug. 14, 1946. 626,866.

Process for the preparation of a mixture of nucleotides containing a predominantly adenosintriphosphate.—A. E. Szent-Gyorgyi. Aug. 14, 1944. 626,711.

Preparation of crotonic acid derivatives and of phenanthrene derivatives therefrom.—Organon Laboratories, Ltd., and W. C. J. Ross. Aug. 14, 1946. 626,712.

Method of introducing an amino group into the nucleus of an aromatic compound.—J. S. F. Turski. Sept. 2, 1946. 626,661.

Removal of fluorine from acid nitrate-containing solutions.—Directie Van de Staatsmijnen in Limburg. June 9, 1942. 626,662.

Manufacture of N-alkyl or N-aralkyl derivatives of oxazolidine-2:4-diones.—British Schering Research Laboratories, Ltd., J. S. H. Davies, and W. H. Hook. Sept. 16, 1946. 626,971.

Preparation of 1, 2-disubstituted-3-cyanoguanidines.—American Cyanamid Co. Sept. 22, 1945. 626,663.

Reaction chamber for the temperature control of endothermic and exothermic chemical reactions.—J. C. Arnold. (Standard Oil Development Co.). Sept. 18, 1946. 626,664.

Production of dispersions of synthetic resins.—British Cellophane, Ltd., W. Berry, and C. R. Oswin. Sept. 25, 1946. 626,876.

Process of refining intensively cracked gas oil, and producing heating oil and polymerised products therefrom.—C. Arnold. (Standard Oil Development Co.). Oct. 2, 1946. 626,877.

Separation of gases at low temperature.—Petrocarbon, Ltd., and A. A. Aicher. Dec. 3, 1946. 626,894.

Granular smokeless propellant powders.—I.C.I., Ltd., S. Gordon, and E. Whitworth. Dec. 20, 1946. 626,955.

Manufacture of siloxane resins.—Dow Corning Corporation. Jan. 21, 1946. 626,909.

Manufacture of disazo-dyestuffs.—Ciba, Ltd. Jan. 31, 1946. 626,916.

Materials containing polyvinyl derivatives.—Soc. Rhodiaceta. May 3, 1945. 626,988.

Catalytic synthesis of hydrocarbons.—J. C. Arnold. (Standard Oil Development Co.). Feb. 14, 1947. 626,742.

Production of water gas from solid carbonaceous materials.—J. C. Arnold. (Standard Oil Development Co.) Feb. 14, 1947. 626,743.

Method of producing shaped bodies from powdery aluminium.—American Electro Metal Corporation. April 16, 1946. 626,764.

Process for preparing unsaturated acid halides.—N.V. De Bataafsche Petroleum Maatschappij. June 15, 1946. 626,772.

Preparation of rubber hydrochloride.—Frenkel's Machines (Great Britain), Ltd., B. Frenkel, and L. Mitlin. April 17, 1947. 626,778.

Manufacture of the higher fatty acid esters of poly-chlorinated phenols.—E. B. Higgins. Sept. 2, 1947. 626,824.

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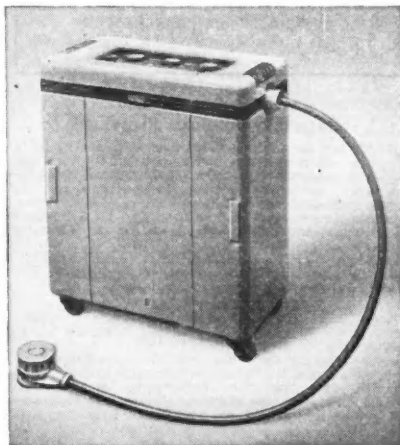
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SITUATION VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order

APPLICATIONS are invited by the Ministry of Supply for the following appointments in the Division of Atomic Energy (Production).

ASSISTANT MANAGER (PRODUCTION), Springfields Factory, Nr. Preston, Lancs., and Windscale Works, Sellafield, Cumberland, to be responsible for the operation of a section of a large chemical plant. Candidates must either have an honours degree in chemistry or chemical engineering, association of the Royal Institute of Chemistry or corporate membership of the Institution of Chemical Engineers. They must have had at least three years on chemical plant operation, preferably in the heavy chemical industry and have experience in the handling of corrosive materials and inflammable solvents and in precautions against toxic hazards. Some knowledge of metallurgical operations would be advantageous. Experience in the management of labour is essential and applicants should state their preference of location. Salary will be assessed according to qualifications and experience within the range £720-£960 p.a. Candidates will normally be confined to natural-born British subjects born within the United Kingdom or in one of the self-governing Dominions, of parents similarly born. Applications should be addressed to **STAFF SECTION, Ministry of Supply, Division of Atomic Energy (Production), Hisey, Nr. Warrington, Lancs.**

A21084

SITUATIONS VACANT

THE RADIOCHEMICAL CENTRE

APPLICATIONS are invited for the following appointments—

- A CHEMIST**, to be engaged upon the Synthesis of Organic Compounds containing Radio-active Elements.
- A CHEMIST**, preferably with experience of Pilot-Scale Work, to develop and operate plant for radio-active processes.

Applicants should be men or women of good professional standing, preferably with previous experience of radio-active work, who are capable of developing the work on their own initiative. They will be required to pass a medical examination, and should be between the ages of 25 and 45. Good salaries will be offered to those having the required experience and qualifications. A superannuation scheme is in force, and in some cases houses will be available at Amersham.

Successful candidates will be appointed to the staff of Thorium Limited (Managing Agents to the Minister of Supply), to whom application should be sent at 10, Princess Street, Westminster, London, S.W.1.

A PERSIAN GULF OIL COMPANY urgently requires a **CHEMIST for Topping Plant**. Must possess Degree in Chemistry or Chemical Engineering. Experience in testing Petroleum and products or allied processes desirable. Age under 35. Salary starting £790 tax free. Free messing and accommodation. Kit allowance. Write giving brief details, age, experience, etc., and quoting K.1010 to Box "E.L.", c/o J. W. Vickers & Co., Ltd., 7/8, Great Winchester Street, E.C.2.

ASSISTANT WORKS ENGINEER required for construction and maintenance of Chemical Works in West Riding, Yorkshire. Applicant should be 25-35 years of age. Should have sound theoretical training and practical experience in mechanical engineering and chemical works plant. Salary approx. £600 p.a. Pension Scheme. Applicants should state age, full details of training and experience to **WORKS MANAGER, Box No. 2834, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.**

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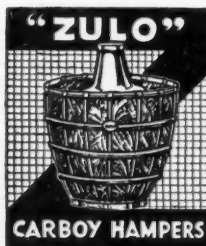
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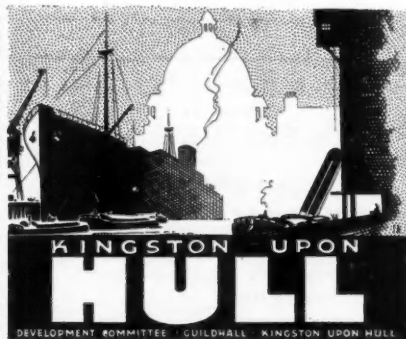


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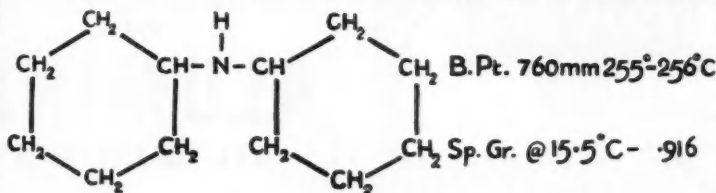
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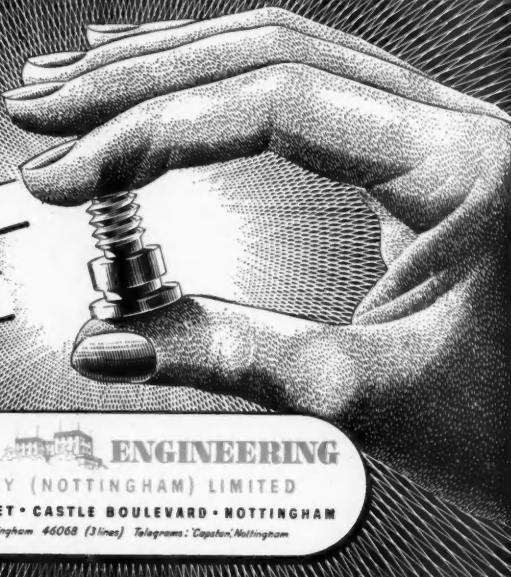
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